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NOTICES.

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Back numbers exceeding three months' date will in future be charged double price, unless six or more consecutive numbers are taken at the same time. Nos. 6, 15, 18, and 23, are out of print; and Nos. 24, 25, and 26, can only be had with the entire series, forming volume 2.

The Editor will be particularly obliged by his friends forwarding to him Notices of all Meetings, Trials, or Appeals, which it may be interesting to the Gas World to have reported.

Circular to Gas Companies.

The Editor may be consulted on all subjects connected with the supply and manufacture of gas, or the alteration and improvement of gas apparatus, and the construction of new works.

It was our intention to have, this month, continued our examination of the so-called hydro-carbon process of making gas from cannel coal; but the elaborate paper of Dr. Fyfe, inserted in another column, narrating his experiments upon it in connection with Boghead cannel, is so conclusive as to relieve us from the necessity of any further reference to this subject, till it is seen whether its advocates are now satisfied with the impracticability of their system, and are disposed to follow the doctor's disinterested advice, and abandon any further experiment upon the gullability of the public.

We perceive with pleasure that the popularly elected Vestry of St. Marylebone have taken up the question of the duty levied by the Corporation of the City of London upon all coals brought within a radius of 20 miles of their Guildhall, with the view of preventing any renewal of the act under which these dues are levied. This act does not expire till 1862, although the whole of the charges will be liquidated three years previously; and projects are stated to be already on foot for absorbing prospectively a portion of the revenue to be derived therefrom. The metropolitan and other gas companies drawing their supply of coal from the port of London contribute upwards of £20,000 yearly towards this tax, the total amount raised from a population exceeding two millions and a quarter being about £150,000, but in the application of which large sum eleven-twelfths of the contributors are without a voice. The matter cannot fail to attract the speedy notice of the new members for the Tower Hamlets and the Borough of Southwark, both of whom have practical experience in the direction of metropolitan gas works—the first as Chairman of the Commercial Gas Company, and the latter as an active Director of the Phœnix Gas Company.

Communicated Articles.

ON THE MANUFACTURE OF HYDRO-CARBON COAL GAS FROM BOGHEAD COAL.

By Andrew Fyfe, Esq., M.D., F.R.S.E.,
Professor of Chemistry, University and King's College, Aberdeen.

In a paper published in the Journal of Gas Lighting for July, 1850, I drew the attention of the public to the quality of resin and water gas, and then stated that the gas thus produced had not the high value that was ascribed to it by those who had introduced it, and that, consequently, its introduction as a source of light ought to be abandoned. That I was correct in my conclusions has been proved by the process having been given up by its most strenuous supporters, and by the patentee himself. Since that time, attention has been drawn to the influence of water over coal gas, and marvellous accounts have been made public of the enormous saving that is to be effected by the introduction of what is now styled "hydro-carbon gas from coal."

In my report on Boghead cannel coal, published in November, 1850, after stating the remarkable qualities of that coal for the purpose of illumination, I concluded by observing:—

"It is valuable, not only on account of the large quantity of gas which it affords, and for the high illuminating power of that gas, as indicated by the photometer—it will be found also to be extremely valuable, from the large quantity of matter condensible by chlorine which it contains, and which is the principal source of light. Accordingly, were Boghead coal gas mixed with gas from inferior kinds of Parrot coal, and from English caking coal, it would add greatly to their illuminating power; or, which is the same thing, were Boghead gas *diluted* with gas from these inferior coals, while the quantity of gas would be increased, the illuminating power of the Boghead coal gas, as indicated by the photometer, would, most probably, be very little diminished. I conceive, therefore, that the Boghead coal will be of great use to those using inferior kinds of coal in the manufacture of gas, such as the poorer Scotch cannel coals, and especially the English caking coal."

At the time that I made the above remarks, I had in my mind gas, not only from *inferior kinds of coal*, but also from water, by the hydro-carbonising process, with the view merely of *diluting* the rich Boghead gas, and of enabling us to consume it advantageously; as I conceive that, by the methods in use for burning gas, those rich in matter condensible by chlorine are not so consumed as to make them give the light that they ought to yield, were they properly burned. Since the publication of that report, I have been anxious to put these opinions to the test of experiment; circumstances, however, have prevented me from doing so till within the last few weeks. Having lately had the opportunity of thoroughly investigating the subject, I shall now proceed to enumerate the

results. These trials, I may state, were undertaken solely with the view of ascertaining whether the use of water would in any way prove beneficial in the manufacture of coal gas for illuminating purposes; and as I thought that Boghead coal, from its great quantity of volatile matter, and from the high per centage of matter condensible by chlorine in its gas, would be most likely to prove the truth or fallacy of these opinions, I have confined my trials entirely to it.

In considering the *hydro-carbon* process, as it is now generally styled, two important questions occur:—

1. Is there any increase in the *amount of light* obtained from a given weight of coal?

2. Is there any economy in using the water and cannel-coal gas, instead of that from Boghead alone?

In the experiments, the results of which I am now to give, the Boghead coal that was used was that with which the gas works at Aberdeen have lately been supplied for the manufacture of their gas.

In my printed report on the value of Boghead cannel, I gave the results of my trials on that which was at that time sent to the works as yielding 14,800 feet of gas per ton; having 27 per cent. of matter condensible by chlorine, one foot of which gave the light of 7·72 sperm candles burning 140 grains per hour—that is, 9·4 candles of 120 grains: thus making 1 foot give the light of 1080·8 grains of sperm; the gas per ton of coal was, consequently, equal to 2283.2lb. of sperm.

To secure accuracy in the trials with water, the quality of the Boghead coal to be used was first ascertained. For this purpose a quantity of it was broken to pieces, and set aside for the experiments, both on the coal alone and for the water process. Six trials were made at different times, in the usual way, excepting that the heat was higher than in the trials formerly reported on. Seven pounds of coal were used in all the trials. The following are the results. The durability is that of a cubic foot burnt through a jet $\frac{1}{33}$ of an inch in diameter, and 5-inch flame. The candle is one burning 120 grains per hour:—

Cubic feet per ton.	Spec. gravity.	Condensation by chlorine.	Durability.	Argand 58 holes consuming feet per hour.	Illuminating power 1 foot = candles.	1 foot = grs. sperm.	Gas of 1 ton = lb. sperm.
			m. s.				
15,866	595	23·75	75 50	4·	10·57	1260·	2856·
15 413	738	26· 0	85 50	5· 5	11·62	1399·2	3082·
17,680	698	23· 0	83 20	3· 6	12·12	1454·6	3674·
16,320	652	20· 0	80 0	3·77	11 93	1431·6	3337·6
15 866	637	20· 0	79 20	4·	11·96	1435·5	3255·
15,413	689	21· 5	82 0	3·87	12·55	1506·	3315·9
16,093	650	19·75	81 3	4 12	11·79	1414·5	3253·5

The average of these trials gives one foot of gas, equal to 11·79 candles of 120 gr., and the gas from a ton of coal equal to 3253·5 lb. of sperm: a much higher quantity than I got before, but it must be kept in recollection that it was this cargo of coal on which the water trials were made.

In conducting the trials with the Boghead and water together, I had recourse to an apparatus similar to that erected by Mr. White at Grand Holm, in the neighbourhood of Aberdeen, and to those used at Manchester and other places. It consisted of two iron retorts: one for the generation of water gas, the other for the coal gas. Each retort was 2 feet 6 inches long, ⏢ shaped, and 9 inches wide. In each there was a diaphragm, passing from the mouth to within 3 inches of the other extremity, dividing it into an upper and under compartment, shut off from each other, excepting at the back end. Both compartments of the water retort were filled with charcoal, and a tube from a tank conveyed water into its upper compartment, by which the water was made to pass first through the charcoal in it, and then in the lower one, from which the gas generated, along with surplus steam not decomposed, passed through the coals into the lower, and then into the upper compartment of the coal retort, From this it proceeded to the hydraulic main, the condenser, and purifier, to the gasholder, in the usual way. In all the trials two gasholders were used; these were exactly of the same dimensions, were nicely equipoised, and accurately graduated. The whole of the gas thrown off was propelled into them uniformly in the same ratio during the whole of the performance of the experiment, as was proved by their rising in the same ratio; but, to secure accuracy, the gas in each was tested, and found to be of the same composition. In manufacturing the gas, sometimes the usual heat, sometimes a higher, occasionally a lower heat was resorted to. In ascertaining the illuminating power by the Bunsen photometer, a sperm candle, burning 140 gr. per hour, was always employed, and then proportioned to one consuming 120 grains, so as to enable me to compare the results with those of other experimenters. The gas was burned by a 58-hole Winfield argand; and different trials were made with each gas, to find out the most profitable consumpt. It is unnecessary for me to record all the trials; I leave out those made at first with the view of finding out the proper mode of proceeding, as I found that the process is a very uncertain one, the results varying very much, even when it seems to be conducted under similar circumstances.

The following is a tabular view of the results of the eight best trials:—

Cubic feet of gas per ton of coal.	Specific gravity of gas.	Condensation by chlorine.	Durability jet $\frac{1}{33}$, 5-inch flame.	Argand having 58 holes consuming feet per hour.	Illuminating power per foot = cand. 120 grs.	1 foot = grs. sperm.	Gas per ton = lb. sperm.
			m. s.				
39,893	434	8· 5	35 45	8·0	4·61	553·2	3152·6
39,893	453	9·33	40 50	8·0	5·25	630·	3590·
39,893	536	11· 0	43 0	9·0	5·13	615·6	3508·
38,986	646	12· 0	46 40	7·2	5·46	655·2	3649·
38,986	666	11· 0	44 10	7·2	4·08	489· 6	2726·5
39,893	663	12·75	46 0	7·2	4·85	582·	3316·8
39,896	600	11·33	46 30	7·5	5·02	601·2	3426·5
38,986	606	11·25	42 40	8·3	3· 5	420·	2339·
39,553	575	11·44	43 20	7·8	4·73	568·5	3213·5

In the two first and the two last of these trials, the production of gas was continued till the desired quantity was obtained. In the others, it was carried on during the same, or nearly the same length of time, that by previous trials was found to be necessary for carbonising the same quantity of coal alone. In these instances, the water was more rapidly propelled through the retort than in the others, especially towards the commencement of the process.

These trials show that the process is very uncertain in its results, even when it is conducted under similar circumstances. The average of all the above-mentioned trials is, that from a ton of Boghead coal by the water process, there are obtained in this way 39,553 feet of gas, each foot of which gives the light of 4·73 candles, burning 120 gr. per hour: that is, 568·5 gr. of sperm, making the gas from a ton of coal give the light of 3213·5 lbs. of sperm.

These results may be considered as what the hydro-carbon process will yield; indeed, they nearly correspond with those given by Dr. Frankland and Mr. Clegg; for, though the quantity of gas is inferior, yet the illuminating power of each foot is superior, and thus the lbs. of sperm per ton of coal are nearly the same.

Dr. Frankland, in his report (JOURNAL OF GAS LIGHTING, Jan., 1852), states that from Boghead cannel he obtained 13,240 feet of gas per ton, the illuminating power of which per foot was 10·52 candles of 120 gr.; consequently each foot was equal to 1262·4 gr., and the gas of the ton was equal to 2387·7 lb. of sperm. In my trials the average was 3213·5 lb. per ton; therefore, 34 per cent. beyond his. From Boghead and water Dr. Frankland got 51,720 feet per ton, the illuminating power of which was equal to 4 candles per foot; and the total quantity was, therefore, equal to 3546·5 lb. The average of my trials was 3213·54 lb.

Mr. Clegg, in his report published after most of the foregoing trials were made, has given very nearly the same results. He obtained 52,000 feet of gas from a ton of Boghead coal by the action of water, each foot of which was equal to 4 candles—that is, to 480 gr. sperm; the total quantity was, therefore, equal to 3515·7 lb. We may, therefore, consider the results of my trials as correct; and thus confirming, to a certain extent, those of Dr. Frankland and Mr. Clegg, viz., that from a ton of Boghead coal by the action of water, a quantity of gas can be obtained which, when properly consumed, will give the light of about from 3200lb. to 3500lb. of sperm. They differ, however, from them in two very important points: my gas, by the water process, though giving about the same light, was not nearly so great in quantity; it was about 24 per cent. less. Again, in Dr. Frankland's trials, the quantity of gas from Boghead coal amounted only to 13,240, and the lb. of sperm to 2387·7 per ton of coal. The increase in quantity of light by the water process was, therefore, 47 per cent. In my trials, though the amount of sperm per ton was in some a little more, yet *the average of all the trials gave a little less by the water process than by Boghead alone.* I think that this may be satisfactorily accounted for by the low results obtained by Dr. Frankland from the Boghead coal. I have never had a smaller quantity than 14,200 feet per ton, with one exception, in which case it was only 13,370 feet. Of 12 trials, the quantity varied from 14,200 to 17,680 feet. This may be owing to the low heat at which the gas was driven off, by Dr. Frankland, and which he states is the best, both for the coals alone and for the production of gas by the water process. On the contrary, I have found the best results are got from Boghead coal by using a heat higher than usual. The best result I ever had was that in which the heat was *very high*. In that case I got 17,680 feet; and, what is remarkable, the illuminating power of the gas was also higher: it was equal per foot to 12·12 candles of 120 gr.; that is, equal to

3673 lb. of sperm per ton of coal—a quantity *beyond that got by Dr. Frankland by the water process.*

The above remarks apply solely to trials with Boghead coal, so as to obtain from it a large quantity of gas, the illuminating power of which will be about 4 or 4·5 candles per foot; and, in my opinion, they are sufficient to warrant the conclusion, that though there is an increase in the quantity of gas per ton of coal by the water process, which no one ever doubted, yet that *there is no increase in light from the gas of a ton of coal compared with that obtained in those instances in which the carbonising of the coal alone is properly conducted.*

Admitting the accuracy of the conclusion to which I have come, and which, in my opinion, the results of my trials warrant, I have next to consider whether there may not be a gain by obtaining a much larger quantity of gas, even though it is of inferior illuminating power.

The results of the trials which I am now to give, were conducted on a smaller quantity of coal, in the same apparatus. The heat of the water retort was kept high, to enable me to pass through it the requisite quantity of water, which, as has *been recommended*, was propelled as rapidly as could be done, towards the commencement of the process. The following are the results of five trials :—

Cubic feet gas per ton of coal.	Specific gravity of gas.	Condensation by chlorine.	Durability jet $\frac{1}{33}$, flame 5 inch.	Argand feet per hour.	Illuminating power per foot, = cand. 120 grs.	1 foot = grs. sperm.	Gas per ton = lb. sperm.
			m. s.				
52,133	466	5·75	35 20	8.	2· 1	252·	1876· 8
52,359	466	6· 5	35 30	9·	1·91	229·6	1717· 4
52,359	460	6· 0	33 50	9·	2·06	240·8	1801·14
51,680	460	5·25	35 0	9·	2·11	253·4	1870·96
51,680	460	5· 5	34 10	9·	1·81	217·	1602·
52,042	462	5· 8	34 40	8·8	1·99	238·56	1773·6

These trials prove satisfactorily that there is, by this mode of operating, not only no gain, but actually a loss of light *to a very great extent.* From a ton of Boghead coal alone I got gas, the light of which was equal to 3253·5 lb. of sperm. By this process, though the quantity of gas was great, yet the light of that gas per ton did not exceed 1773·6 lb. of sperm, showing a loss of 1479·8 lb. of sperm on the whole quantity—that is, 46 per cent.

Dr. Frankland states that he got 51,720 feet of 4-candle gas from a ton of coal, by the hydro-carbon process; making the lb. of sperm per ton equal to 3546·5. The gas of a ton of Boghead alone was in his experiments equal to 2387·7 lb. of sperm, there being, therefore, according to him, an increase in the amount of light of 1158·8 lb. of sperm—that is, of 48 per cent. In my trials, instead of an increase, there was a loss of 1772·3 lb. of sperm on the whole quantity—that is, of 46 per cent.

How are we to reconcile these discordant results? I have already stated that, while Dr. Frankland got gas from Boghead alone equal to 2387·7 lb. of sperm, I got gas equal to 3253·4 lb. But Dr. Frankland's gas, when 51,720 feet per ton were obtained, was equal to 3546·5 lb. of sperm; which, though an increase of 48 per cent. on the Boghead gas by his own trials, is only 9 per cent. over the Boghead gas by mine. Why I have always had a loss instead of a gain, I cannot conceive. The only difference in the modes we have followed, in ascertaining the quality of the gases which we produced, is, that he received into his gasholder only a *part* of the gas as it was evolved from the coal, and of which gas only he tried the illuminating power; while I received the *whole* of the gas into my gasholders, and tested it. Surely my method is the more correct of the two, and claims more confidence in its results. Be this as it may, I conclude from these trials that, by the further use of water, no benefit is derived; indeed, that while the use of a small quantity of water does little harm in diminishing the amount of light, the use of a large quantity of water, with the view of procuring a large quantity of gas, proves injurious to a considerable extent. In further proof of this I give only one trial. In it the illuminating power per ton of coal was reduced in a very great degree.

Gas per ton.	Specific gravity.	Condensation by chlorine.	Durability.	Argand feet per hour.	Illuminating power 1 foot = cand.	1 foot = grs. sperm.	Gas per ton = lb. sperm.
			m. s.				
75,253	640	4·125	29 10	9	0·27	32·4	348·3

According to Mr. Clegg, 75,000 feet of gas, of 2·4 candles per foot, were got from a ton of Boghead—that is, equal to 2880 lb. of sperm per ton. I could only get 345·4 lb. How to reconcile these very discordant results I know not. I wish much that Mr. Clegg had stated the details of the process by which he succeeded in procuring this large quantity of gas, and how he ascertained the illuminating power. That there must be a great loss in all attempts to obtain a large quantity of gas from Boghead is evident. It is well known that, when this coal is carbonised at a low heat, it yields either a comparatively small quantity of gas, or, if the gas be in larger quantity, it is of low illuminating power. In trials with water, in which, with the view of obtaining a large quantity of gas, the water is propelled through the retort rapidly, to produce, as it is supposed, the full beneficial effect, the heat must be brought very low. Hence, probably, the cause of the loss in the illuminating power when we attempt to increase the quantity of gas.

Though, by the use of water to get a large quantity of gas from Boghead coal, there is no increase in the amount of light from the gas of a ton of coal, yet there may be some beneficial influence exerted when the water is used, as to yield a much smaller quantity of gas. One trial was made in this way, and the following is the result :—

Gas per ton.	Specific gravity.	Condensation by chlorine.	Durability.	Argand feet per hour.	Illuminating power 1 foot = cand. 120 grs.	1 foot = grs. sperm.	Gas of 1 ton = lb. sperm.
			m. s.				
24,932	554	11·75	48 20	6·8	6·51	781·2	2782·4

In this case, though the increase of gas amounted to 54 per cent., yet there was a loss of light in that obtained from Boghead alone to the extent of about 15 per cent.; still further proving that water not only does not exert any beneficial influence, but that, in most cases, it actually proves injurious, by reducing the total amount of light got from the coal in the usual way of carbonising it.

The remark made regarding the uncertainty of the process is also still further proved by the above trial. It seems difficult so to regulate it as to obtain always the same results.

From what has now been said, I think I am still further warranted in coming to the general conclusion that, *in no instance is there any gain in the amount of light from Boghead coal gas by the agency of water in the method recommended by the advocates of the "hydro-carbon gas,"* and that, in those cases in which the quantity of gas is increased to a great extent, there is a decided loss by the agency of the water.

I come now to consider the question of economy. Assuming that my experiments prove that there is no gain in the amount of light by the combustion of the gas from a ton of Boghead coal by the water process, a question here arises, may not the large quantity of hydro-carbon gas be manufactured at a less expense than the gas from the coal alone? That it may be so per 1000 feet we can easily imagine; but this is not the question to be solved. Gas, like other articles, ought to be paid for according to its value. The more light that 1000 feet will yield when properly consumed, the more ought to be paid for it; of course the consumer ought to keep this in view, viz., the lower the quality of the gas that he burns, the less ought he to pay for it. I fear that this has not been attended to by those who have so strongly advocated the manufacture of a larger quantity of gas from coal by the addition of other substances, such as in the "hydro-carbon" process. I enter upon this part of the subject with diffidence, because I have no satisfactory trials of my own on the results of which I can found calculations. In the trials which I have above recorded, I found that 2 lb. of charcoal were consumed in the water retort, when 7 lb. of coal were carbonised in the other; and that, to bring out the best results, the quantity of water to be passed through the water retort required to be nearly equal in weight to the coal to be carbonised in the other. Accordingly, for each ton of coal used, it would be necessary to evaporate about a ton of water, and to consume about a quarter of a ton of charcoal, or rather of coke, to produce the requisite quantity of water gas. These would, to a certain extent, show the additional quantity of fuel necessary in the hydro-carbon process. Fortunately, however, there is no necessity for having recourse to calculations founded on these data, and to which, no doubt, objections would be raised. We have statements given of the expense of manufacturing water gas; and, though there is a wide difference between them, I shall take those given by Mr. Clegg in his report, not because I consider them correct, for I think he states the expenditure by far too low, but because they are given by one who advocates strongly the hydro-carbon process, and whose report has been extensively circulated by those who have an interest in it. Surely they will not find fault with me for adopting these statements.

In Mr. Clegg's report it is stated that 1000 feet of Boghead coal gas cost in the manufacture, including coal at 28s. per ton, labour, lime, fuel, repairs on retorts, &c., 2s. 11½d.—that is, 35d·5. According to Mr. Clegg, water gas, manufactured by the passage of steam over coke, costs 5d. per 1000 feet; and 1000 feet of

hydro-carbon gas from Boghead coal, at 28s. per ton, will cost, including the same items, 1s. 0¾d.—that is, 12d·75; 13,500 feet being got from the ton of Boghead when carbonised alone; 52,000 feet from the ton by the water process. The comparative expense, then, of the manufacture of gas per 1000 feet, is as 35·5 to 12·75, or very nearly 3 to 1, when the quantity of hydro-carbon gas stated is got from the ton of coal. Of course the price per 1000 feet will vary according to the quantity obtained, 5d. per 1000 feet being taken as the price of the pure water gas itself. Were the gases of equal illuminating power, then there would be a very great saving; but, in ascertaining the value of a process of this kind, the value of the gas, not only bulk for bulk, but of the total quantity per ton of coal, must likewise be taken into account. The results of my trials show that each foot of the Boghead gas gives the light of 11·79 candles, consuming 120 grains per hour, while a foot of the Boghead and water gas gives that of only 4·73 candles; consequently, to get the same light from both, for every 1000 of the Boghead gas used, we must consume 2490 of the hydro carbon gas, and must pay accordingly for it. The consumer ought to be aware of that, and, consequently, he ought to get his hydro-carbon gas, per 1000 feet, for less than half the price that he pays for the Boghead, otherwise he is a loser by using it instead of the Boghead, or another gas of the same illuminating power as the Boghead. But, again, the important question here occurs, can the manufacturer afford to dispose of his hydro-carbon gas at this lower rate? If the statements that have from time to time been published regarding the hydro-carbon gas be correct, then he ought to do so; but, on further investigation, I fear we must come to a very different conclusion.

Assuming the accuracy of the results of my trials with Boghead, and with Boghead and water together, let us see how the matter stands; and what I have now to say, applies not only to my own experiments, but likewise to those of Dr. Frankland and Mr. Clegg. The average result of my six trials on Boghead coal yielded 16,093 feet of gas per ton. Take the coal at 28s. per ton, then

Cost of coal	28s., or 336d.,	or 20d·87 per 1000 ft.
Manufacture according to Clegg	143d·775, or	8d·934 do.
Total charge per ton .	479d·775, or	29d·804 do.

This gas gave the light of 11·79 candles per foot—that is, 3253·5 lb. sperm per ton; 1000 feet, therefore, equal to 11,790 candles, cost 29d·8.

The average of my eight trials with Boghead and water gave 39,553 feet per ton of coal; then, as before,

Coal and manufacture .	16,093 feet,	479d·775
Water gas according to Clegg	23,460 ,, at 5d.	117d·3
Total coal and water gas, cost .		597d·075, or 15d·09 per 1000.

The gas gave the light of 4·73 candles per foot—that is, 3213·5 lb. sperm per ton; 1000 feet, therefore, equal to 4730 candles, cost 15d·09.

Then,

lb. sperm per ton, Boghead.	lb. sperm per ton, Boghead and water.	Cost of coal gas per ton.	Comp. cost of coal gas.

3253·5 : 3213·5 : : 479·77 : 473·87; and 597· : 473·87 : : 100 : 79·3

Saving in favour of Boghead gas alone = 20·7 per cent.

Again,

3213·5 : 3253·5 : : 597 : 604·4; and 604·4 : 479·77 : : 100 : 79·3

Saving in favour of Boghead gas alone = 20·7 per cent.

The same results are got by another process. The Boghead gas for 11,790 candles cost 29d·8. The Boghead and water gas for 47,300 cost 15d·09.

Candles per 1000 feet coal gas.	Candles per 1000 feet coal and water gas.	Cost of coal gas.	Comp. value of coal and water gas per 1000 feet.

11,790 : 4730 : : 29·8 : 11·95; and 15·09 : 11·95 : : 100 : 79·1

Saving in favour of Boghead gas alone = 20·9 per cent.

Candles of water gas.	Candles of coal gas.	Cost of coal gas.	Comp. value of coal gas.

4730 : 11,790 : : 1509 : 37·6; and 29·8 : 37·6 : : 100 : 79·2

Saving in favour of Boghead gas alone = 20·8 per cent.

In these calculations the results do not exactly correspond, because I have not thought it necessary to extend the fractions. They are sufficient to show, that according to the results of my trials, in which the quantity of hydro-carbon gas per ton of coal was 39,553 feet of 4·73-candle gas per foot, there is an actual loss by the use of water in the hydro-carbon process to the extent of about 20 per cent.; and this loss is incurred in the manufacture of the gas, independent of other items.

I have next to advert to those instances in which the quantity of hydro-carbon gas per ton of Boghead was greater. When 52,042 feet of gas were obtained, the illuminating power per foot was on an average only 1·99 candles—that is, 238·56 grains of sperm per foot, and 1773·6 lb. per ton of coal.

Then, as before:—

1 ton coal, yielding	16,093 ft.,	total cost	479d·775
Water gas ..	35,950 ft.,	do.	179d·752, or 5d. per 1000 feet.
	52,042	do.	659d·527, or 12d·672 per 1000 ft.

One foot of gas was equal to 1·99 candles—that is, 1773·6 lb. of sperm per ton of coal. Total cost, 659d·527.

One foot of Boghead coal gas, as before, equal light of 11·79 candles—that is, 3253·5 lb. sperm per ton. Cost, 479d·77. Then

Coal gas = lb. sperm per ton.	Coal and water gas = lb. sperm per ton.	Cost of coal gas.	Comp. value of coal and water gas.

3253·5 : 1773·6 : : 479·77 : 261·5; and 659 : 261·5 : : 100 : 39·6

Saving in favour of Boghead gas only = 60·4 per cent.

Coal and water gas = lb. sperm per ton.	Coal gas = lb. sperm per ton.	Cost of coal and water gas.	Comp. value of coal gas.

1773·6 : 3253·5 : : 659·5 : 1209·7; and 1209·7 : 479·77 : : 100 : 39·7

Saving in favour of Boghead gas only = 60·3 per cent.

Again,

Candles per ft. coal gas.	Candles per ft. water and coal gas.	Cost of 1000 ft. coal gas.	Comp. value of 1000 ft. coal and water gas.

11·79 1·99 29·8 5·03; and 12·672 : 5·03 : : 100 : : 39·69

Saving in favour of Boghead gas only = 60·3 per cent.

Coal and water gas.	Coal gas.	Coal and water gas.	Coal gas.

1·99 : 11·79 : : 12·672 : 75·077; and 75·077 : 298 : : 100 : 39·7

Saving in favour of Boghead gas only = 60·3 per cent.

By this mode of operating, the above results show that the coal gas is the cheaper light by upwards of 60 per cent.

That the hydro-carbon process is not economical, is also shown by comparing the lowest results I obtained by Boghead coal alone, with the highest results by the Boghead with water. The two lowest results by Boghead alone yielded, on an average, 2969 lb., and the two highest by Boghead and water, 3619 lb. of sperm per ton. Taking the price the same as before, then

2969 : 3619 : : 479·77 : 584·8, and 584·8 : 597 : : 100 : 102,

there is, therefore, an increased expenditure of 2 on the 100 against the water process.

Taking the *lowest* of my results by the Boghead against the *highest* by the Boghead and water, the former is as 2856 lb. to 3649 lb. of sperm, by the latter. Take the expense for each, the same as before, then,

2856 : 3649 : : 479·77 : 612·98; and 612·98 : 597 : : 100 : 97·3

Hence, under the most favourable circumstances for the hydro-carbon gas, the same amount of light can be obtained by the usual process from Boghead alone for very nearly the same expense; the difference being only 2·7 per cent. in favour of the hydro-carbon process.

I have next to advert to the trials of Dr. Frankland and Mr. Clegg.

Dr. Frankland obtained from Boghead coal alone 13,240 feet of gas, 1 foot of which was equal to 10·52 candles—that is, 2387·7 lb. of sperm per ton of coal. From Boghead and water, he got 51,720 feet of 4-candle gas—that is, 3546·5 lb. of sperm per ton. Taking Mr. Clegg's estimate of the cost of Boghead gas at 35d·5 per 1000 feet when the coal is at 28s. per ton, then the cost of manufacture of 13,240 feet is 470d., which gas yields the light of 2387·7 lb. of sperm; the cost of hydro-carbon gas from the same coal at the same price, according to Mr. Clegg, is 12d·75 per 1000 feet, and, therefore, 51,720 will cost 659d., which is equal to 3546 5 lb. of sperm: then—

3546·5 : 659 : : 2387 : 443; and 470 : 443 : : 100 : 94·2

Therefore, to get the same amount of light, there is a saving on the cost price of the gas of 5·8 per cent. in favour of the hydro-carbon process, according to Mr. Clegg's calculation of the expense. Allowing the accuracy of this statement, it will naturally be asked how it is to be reconciled with that given by Mr. Clegg. In his report, Dr. Frankland alludes merely to the *increase in the quantity of gas* by the hydro-carbon process, and to the consequent *increase in the light* afforded by the combustion of this gas, without reference to expense. Mr. Clegg has, in addition to this, referred to the expenditure of manufacture, and consequent economy of the process. But in this last part of the statement he has made a very important omission. According to him, Boghead coal yields 13,500 feet of gas per ton, while the same quantity of coal affords, by the hydro-carbon process, 52,000 feet of 4-candle gas per foot, the candles burning 120 grains per hour; and he then assumes the saving to be to the enormous extent of 285 per cent. Were this really the case, it ought at once to ensure the universal introduction of the hydro-carbon process. In this statement, however, the increase in the *quantity of gas* only is referred to, for—

73,500 : 52,000 : : 100 : 385

But Mr. Clegg has not taken the *quality* of the gas into account.

Had he done so, he should have stated the result very differently.

In his report, it is said that the data on which his calculations are based are got from practical experiments made, first, by Dr. Frankland, and afterwards by himself, with a view to test the accuracy of Dr. Frankland's report. Though Mr. Clegg has not given the illuminating power of the Boghead coal gas to which he refers, but as he alludes to Dr. Frankland's experiments, which he is endeavouring to verify, we may take the illuminating power given by Dr. Frankland—that is, 10·52 candles per foot.

Taking this, we shall see the result in a very different light. 13,500 feet of Boghead coal gas cost, according to Mr. Clegg, 470d., and yield the light, according to Frankland, of 2431·7 lb. of sperm; 52,000 feet of Boghead hydro-carbon gas, according to Mr. Clegg, cost 663d., and give the light of 3565·7 lb. of sperm; then

3565·7 : 663 :: 2431·7 : 446

But the Boghead coal gas for this light costs only 470d.; and

470 : 446 :: 100 : 94·8

Accordingly, to get the same light, the saving in the manufacture is, by Mr. Clegg's own statement, only 5.2 per cent.

Again, Mr. Clegg has stated that Boghead coal per ton will yield, by the water process, not less than 75,000 feet of 2·4-candle gas per foot, and that there is thus *an increase of* 460 *per cent.* This statement, taken in conjunction with others in the report, is apt to lead to the impression that there is thus a gain by the hydro-carbon process to an enormous extent; we shall find, however, on further investigation that, taking Boghead coal as before, at 28s. per ton, the cost of 1000 feet of the hydro-carbon gas, when 75,000 feet per ton of coal are obtained, is, according to Mr. Clegg, 10½d., thus making the total quantity per ton amount to 787d·5. The gas per foot being equal to 2·4 candles, the light per ton of coal will be 3085 lb. of sperm. Here, notwithstanding what Mr. Clegg has stated regarding the hydro-carbon process in another part of the report, that there is an "increase in volume without diminution of light," we find that there is an actual loss on the previous process. 52,000 feet of 4-candle gas are equal to 3565·7 lb. of sperm; but 75,000 of 2·4-candle gas are equal to only 3085 lb.; there is, therefore, a loss of 14 per cent. on the total amount of light.

With regard to the cost, the gas from Boghead coal cost, as before, 470d., and is equal to 2387·7 lb. sperm. Then,

3085 : 787·5 :: 2387·7 : 609

But the light of 2387·7 lb., by the Boghead alone, costs only 470d.;

and 470 : 609 :: 100 : 129·5

Accordingly, to get the same light by the hydro-carbon process that we can get by the Boghead alone, there is, by Mr. Clegg's own showing, an increased expenditure of 29·5 on the 100.

In my trials, when 75,253 feet of gas were got by the hydro-carbon process from the ton of coal, the light per foot was only that of 0·27 of candle—that is, 32·4 grains of sperm per foot, or 348·3 lb. of sperm per ton of coal, at the cost, as before, of; then

Cost. Cost.
348·3 : 787·5 :: 3253·5 : 7356; and 479·77 : 7356 :: 100 : 1116

Here the increased expenditure for the same light is 11·16 times the cost of coal gas alone, showing still further the loss incurred by the water process.

In the trial in which the quantity of hydro-carbon gas per ton was smaller than those above given, a loss is also occasioned. When the gas was 24,932 feet per ton, the illuminating power per foot was 6·52 candles—that is, 78·24 grains of sperm, or 2786·6 lb. per ton of coal.

	Per ton.	
Cost of Boghead gas, as before	16,093	479d·77
Water gas	8,839	44d·19
Total cost	24,932	523d·96, or 32d.5 per 1000 feet.

Then,

2786·6 : 523·96 :: 3253·5 : 612·1; and 479·77 : 612·1 :: 100 : 125

The extra expenditure is in this case 25 per cent. for the same amount of light that I get from Boghead alone.

All of these statements still further prove that the hydro-carbon process not only is not economical, but, when carried to a great extent, is an expensive one; and it must be kept in remembrance that the above calculations refer solely to the cost of manufacture. There is no allusion to the enlarged gasholders, pipes, &c., necessary for the increased amount of gas that must be supplied to obtain the same light that is got from Boghead gas, and all of which must add materially to the expense.

I have said that there is a wide difference between the statements of Mr. Clegg and others regarding the expense of manufacturing water gas. Mr. Clegg says that it can be made at the cost of 5d. per 1000, which includes expense of materials, labour, tear and wear, &c. In the June number of the JOURNAL OF GAS LIGHTING, reference is made to the experiments of Magnier and others, from which it is inferred that the expense will come to 12d. From data given to me by a gas engineer of this place, it would seem to be not less than 10d. If these statements are correct—and I believe the last mentioned is below the mark—then the expense of the manufacture of gas by the hydro-carbon process must be far greater than what Mr. Clegg has given it, and, consequently, the loss by the use of water must be still greater than I have stated it to be.

It must, also, be kept in recollection that the expense of manufacturing gas must vary in different places, not only because the cost for materials differs, but likewise because the expense of labour, outlay on tear and wear, according to the extent of the works, is different. In taking the expenditure as given by Mr. Clegg, I have, I think, taken it at a low estimate.

The preceding remarks regarding the hydro-carbon process refer alone to its application to the Boghead coal. I have already said that I preferred that coal to others, because, from the large per centage of matter condensible by chlorine which its gas contains, I considered it by far the most likely to be affected beneficially. It was my intention to extend my trials to other coals, had I obtained anything like a saving with the Boghead coal. The results of the trials I have now recorded, render it, in my opinion, quite unnecessary to take up time in trying the process with other coals. I trust that what has been written will be sufficient to prove that there is no economy in the hydro-carbon process; and that, when all things connected with the manufacture and quality of the gas are taken into account, it is a process which ought to be at once abandoned.

THE CHEMISTRY OF GAS LIGHTING.

(*Continued from page* 359.)

One of the most important subjects arising out of the manufacture of coal gas, is the utilisation of the ammonia generated during the decomposition of coals by heat. This ammonia presents itself in two forms, and under various states of combination. Thus, part is to be met with in the ammoniacal liquor, and part in the impure coal gas. In both cases, however, it will be found combined with carbonic acid, hydro-sulphuric acid, hydrocyanic acid, and sulphocyanic acid; in addition to which, the ammoniacal liquor contains hydro-chloric acid, and, if we may rely upon the statements of some late experimenters, hydriodic and hydro-bromic acids are also present in minute quantity; but it is not unworthy of notice, that neither arsenic nor selenium have yet been detected in any of the products from coal.

From the result of numerous experiments made with a view to ascertain the real facts of the case, we are able to state that, during the distillation of the ordinary kinds of Newcastle coal, the quantity of ammonia given off by each ton, is equal to the manufacture of about 38 lb. of sulphate of ammonia. Of this, rather less than one-third is contained in the ammoniacal liquor, and somewhat more than two-thirds exist in the gas. The gas liquor from one ton of coal, may be taken on an average at 10 gallons, each gallon of which will yield from 18 to 20 ounces of commercial sulphate when properly treated with sulphuric acid. The value or strength of this liquor is roughly determined from the quantity of strong sulphuric acid which it can neutralize. For this purpose a measured quantity of the acid is mixed with water to ten times its original bulk, and this dilute acid is then made to act upon a specific quantity of the ammoniacal liquor, until the resulting fluid slightly but permanently reddens the blue colour of litmus paper when dipped into it. The quantity of dilute acid used becomes, consequently, an index of the value of the liquor.

This process is, however, very far from being accurate; for, in the first place, it takes no cognizance of the ammonia combined with the muriatic acid, and which is equal to about three ounces of sulphate per gallon, or one-sixth of the whole; and, in the second place, the litmus is apt to be bleached by the action of the sulphuretted hydrogen of the liquor, and thus mislead the operator. The interests of gas companies now require that this subject should be put upon a proper chemical basis. The true mode of arriving at the exact value of ammoniacal liquor, is by no means complex or difficult, and may be varied to suit particular circumstances. One of the simplest would be to add an excess of muriatic acid to a determined bulk of the liquor, and then to boil the whole for a few minutes, so as to expel the sulphuretted hydrogen. When this is found to be effected, the fluid should be transferred to a glass retort, containing an excess of slacked lime, and distilled from thence with some care into a receiver containing water, and kept perfectly cold by means of ice or very cold water. When nearly the whole of the fluid in the retort has passed into the receiver, a few drops of a solution of litmus should be added to it, so as to render it of a purplish blue colour, and then a quantity of dilute sulphuric acid must be poured in until the blue colour of the fluid assumes a distinctly red tint. This dilute acid ought to be of such a strength that 10 grains of it by weight indicate 1 grain of ammonia, for thus the requisite calculation would be effected by the use of the decimal point alone. Presuming that absolutely pure monohydrated sulphuric acid be taken in the first instance, then such dilute acid as that above indicated would result from mixing together 49 grains of the acid with 121 grains of pure water; for these would weigh exactly 170 grains, and neutralise 17 grains of pure ammonia. The dilute acid, when used for this purpose,

should be contained in a light flask, which being counterpoised in a balance before the commencement of the experiment, the loss of weight afterwards with the employment of the decimal point, gives at once the true value of the ammoniacal liquor.

In addition to the ammoniacal liquor, properly so called, there is another fluid combination of ammonia now obtained at some gas works, by the use of the machine or instrument, called a "scrubber." We shall have occasion to comment upon the action of this scrubber by and by; but, at present, we confine ourselves to the fluid which it produces, and which differs little, except in strength, from the true ammoniacal liquor, and may be analysed in a precisely similar manner.

The principal ammoniacal salts made from gas liquor, are the sulphate and muriate of ammonia; but as the liquor itself, slightly purified, is now coming largely into use as a detergent or washing fluid, it will be better to enter upon a description of the ammoniacal salts in general, after giving a brief outline of the mode of converting common ammoniacal liquor into "washing fluid."

As obtained in the usual way, the "liquor" of gas works consists, as we have seen, of a solution in water of the carbonate, muriate, hydro-sulphate, hydro-cyanate, and sulpho-cyanate of ammonia, all of which salts are decomposed, at a moderate temperature, by the hydrate of lime. As, however, the hydro-sulphate of lime gives rise to an extremely troublesome crust or concretion upon the vessels, in which a mixture of this kind is boiled; it has been found better in practice to remove the hydro-sulphuric acid from the ammoniacal liquor by other means than lime; after which the hydrate of lime may be advantageously employed to effect the total decomposition of the ammoniacal salts. One of the simplest methods of removing this hydro-sulphuric acid, is by means of a metallic salt, or oxide. Thus, for example, the sulphates of lead, zinc, iron, and manganese, will all answer the purpose, or the peroxides of iron and manganese may be employed, the former of which possesses several important advantages, not necessarily included in a description like this. Having, however, removed in one way or other the hydro-sulphuric acid, the next step is to mix the fluid with a slight excess of slacked lime, and to distil the mixture in the manner commonly practised for the manufacture of what is called "hartshorn" or spirit of hartshorn, that is to say, the receiver is made to hold a certain quantity of water, and is kept as cool as possible during the process of distillation. The theory of this matter is singularly simple, being in reality nothing more than an instance of single decomposition, or simple elective affinity. The lime seizes upon the carbonic, muriatic, and other acids, forming with them calcareous salts, whilst the ammonia thus liberated passes with a portion of water into the receiver, where it is cooled and condensed, and constitutes the article known under the name of "washing fluid." It is, in point of fact, an impure solution of ammonia in water, being slightly contaminated with carbonic acid and naphthaline, the latter of which communicates to it, after a few days, a peculiar brown tint, and also the property of becoming red when a little strong sulphuric acid is added to it in a glass vessel. It is, however, quite pure enough for the requirements of the laundress; and where coloured goods are to be washed, its advantages over the fixed alkalies (potash and soda), and also over soap, are perfectly manifest and undeniable, for it can scarcely be said to injure the most fugitive and delicate colours, even when used in the most reprehensible excess. Moreover, it has never yet been known to induce that frightful cutaneous disease, called "the washerwoman's hand."

We now enter upon the manufacture of the sulphate of ammonia. There are in practice two modes of making this salt: one of which consists in simply saturating ammoniacal liquor with sulphuric acid, and evaporating the solution in leaden vessels until it is fit to crystallise, when it is run out for that purpose; the other is, to distil the ammoniacal liquor, and pass the vapours through sulphuric acid until the sulphate of ammonia precipitates of itself from the saturated solution. By the first plan the whole amount of ammonia is secured in the state of sulphate, for even the muriate of ammonia in the gas liquor is decomposed, The process is, however, slow and costly as regards fuel, whilst the "wear and tear" of apparatus is great, and the salt produced has a dirty and objectionable colour. In the second process the ammonia combined with the muriatic acid of the gas liquor remains, and is either lost or requires another operation for its extraction. The resulting sulphate of ammonia is, however, very pure, and the "wear and tear" of apparatus trifling. The form of still called Coffey's still has been patented and much used by Mr. Laming, of Millwall, for the manufacture of the sulphate of ammonia in this latter way, and nothing can exceed the beauty and purity of the article he thus manufactures.

It has been both proposed and also put in practice, to make sulphate of ammonia by the action of sulphate of lime upon gas liquor; and, indeed, this plan is still used in some parts of France. But by this means nothing except the carbonate of ammonia suffers decomposition, the muriate, hydrosulphate, &c., remaining unaffected. The waste is consequently great; and hence, except where sulphate of lime is excessively cheap, this method does not pay.

It was customary, a few years since, to convert sulphate of ammonia into muriate by double decomposition, but the method has been abandoned in consequence of the great abundance and cheapness of muriatic acid. It is, however, worthy of a notice here. To effect the desired change, a quantity of sulphate of ammonia and common salt, or chloride of sodium, were dissolved together in the smallest possible quantity of boiling water. When the solution was seen to be complete, the mixed salts were run out into a cooler, where crystals of sulphate of soda presently formed; and these being removed, the residuary liquor containing the muriate of ammonia was evaporated to dryness, and subjected to the process of "sublimation" in proper vessels. The nature of the decomposition thus brought about was as follows: the chloride of sodium having assumed the form of muriate of soda by taking up an atom of water, immediately reacted upon the sulphate of ammonia in the solution, the soda combining with the sulphuric acid to produce, as we have seen, sulphate of soda, and leaving the muriatic acid to combine with the ammonia, and form muriate of ammonia; thus:—

Original Materials.		New Products.
Sulphate of Ammonia	{ Sulphuric acid / Ammonia }	Muriate of Ammonia.
Muriate of Soda	{ Muriatic acid / Soda }	Sulphate of Soda.

The relative proportion of these ingredients in a pure state should be 60 parts of chloride of sodium and 66 parts of sulphate of ammonia, but in practice equal weights were formerly used.

The present system of making muriate of ammonia is by saturating the ammoniacal liquor (either before or after distillation) with muriatic acid, and evaporating it in the usual manner, so as to obtain crystals, which are subsequently sublimed and converted into sal ammoniac. But this salt is now obtained so largely as a waste product of the purification of coal gas, that its special manufacture will probably soon cease; for, as we shall presently show, the quantity of muriate of ammonia capable of being procured from the impure gas, is at least double of that to be derived from the ammoniacal liquor, and, moreover, costs nothing.

(To be continued.)

Correspondence.

COAL AND CANNEL GAS.

Sir,—In a foot-note to Mr. Lewis Thompson's article, "On the Illuminating Power of Gas in the Metropolis," inserted in the Journal for May last, it is stated that the low illuminating power of the gas supplied by the Central Company, as compared with that supplied by the City Company, is caused by a larger quantity of cannel coal being used in its production than in that of the City gas; and, also, that the Central gas, when burning, seems "white and thin," the City "yellow and rich"; the former giving "intensity of light," the latter "quantity also."

Now, sir, it does appear strange to me that the mixing of a coal which produces good gas with that which yields gas of an inferior quality should have the effect of making the bad worse. I rather think it would be a difficult matter for Mr. L. Thompson to get any gas manager to believe that such is the case.

I am sceptical as to the mixture of cannel coal causing the Central gas to appear "white and thin"; as I invariably find that cannel coal gas is only rendered "white and thin" by being mixed with gas produced from coal of an inferior quality.

As to the City gas appearing "yellow and rich," it must have greatly improved since last summer, as in my journeyings through London from Limehouse to Chelsea one way, and from Peckham to Agar-town the other way, I did not see any gas burning which had the least appearance of that "yellow and rich," or, as we would rather say, "creamy" colour, which cannel coal gas so pre-eminently possesses. James Robb.

Haddington, N.B., June 5, 1852.

Sir,—I thank you for allowing me a sight of a copy of Mr. Robb's lucubrations on the subject of gas light. He is evidently writing on a matter of which he knows little; for, had he taken the trouble to make the necessary experiments upon the question at issue, he would not only have learned something of which he is still ignorant, but also have saved himself the expense of postage to London. When cannel-coal gas is tested against Newcastle coal gas of equal illuminating power, the side of the photometer disc next to the cannel gas is "blue," that next to the Newcastle coal gas being "light brown" or "yellow." Hence, *in part*, I drew the inference long ago expressed in your Journal, and the entire correctness of which has, within the last few days, received a remarkable confirmation; for I have just been informed, on the best possible authority, that cannel coal is not used at all in the City Gas Works; whereas it is used at the Great Central, just as I stated. If, however, Mr. Robb will carefully read over the original observations on this subject, he will see that other circumstances are also included in my remarks, and form, in fact, the great staple of the argument, to which the points he dwells upon are mere corollaries. I envy somewhat the facility of Mr. Robb's photometrical experiments on the City gas, though I do not feel inclined to place much reliance in their results. A man who pretends to determine the quality of the City Gas Company's gas by merely perambulating the streets of London, must not only have a "creamy" imagination, but also a very "milky"

intellect. For my own part, I do not even know the City gas when I see it burning in the streets, yet I have had some experience of it.

LEWIS THOMPSON.

London, July 9, 1852.

MR. LEWIS THOMPSON ON THE ILLUMINATING POWER OF GAS IN THE METROPOLIS.

SIR,—Although I am unable, this month, to furnish a complete report upon the gases supplied to the City of London, yet from the manly and straightforward policy pursued by the City and Chartered Gas Companies, with reference to my position, I can distinctly promise, on all future occasions, to give a complete tabular record. The very circumstances which threatened at the onset to impede my course have now become honourable stimulants to exertion; and I am more than ever resolved to continue and extend my efforts in the cause of truth and justice. Perhaps I may be pardoned for confessing to a certain amount of pleasurable satisfaction at finding these efforts appreciated and acknowledged in the highest quarters. It is to me no small thing that so large a body of gentlemen as that composing the directorates of the City and Chartered Gas Companies should have found me worthy of its entire confidence; nor is it a trifle for me to find that on my account the long-existing terms of a definite contract have been temporarily suspended. If, however, vanity induces me to attach too much importance to these things, yet surely gratitude should impel me thus to acknowledge them. I, therefore, thank the directors of these companies for the compliment which they have paid to my sincerity, and, as I feel that nothing but truth and justice are sought for on their part, so am I determined that these, and these alone, shall be rendered on mine.

General or Monthly Average of the Gases supplied to the City of London by the Gas Companies mentioned, between the 10th of June and the 9th of July inclusive.

	Specific Gravity.	Illuminating Power.	Condensation per Cent.	Heating Power.
CENTRAL ..	·404	13·4	4·20	2795
CITY	·411	14·0	4·34	2870
CHARTERED	·413	14·4	4·10	2886

The average of the Chartered is from eight observations only.

Daily Record of Observations upon the Gases mentioned below, the specific gravity being taken by means of an air pump and flask with a delicate balance, the condensation by bromine, and the illuminating power by a spermaceti candle, burning about 120 *grains per hour, but always reduced to this gravity by calculation.*

	CITY COMPANY.			CENTRAL COMPANY.		
Date.	Specific Gravity.	Illuminating Power.	Condensation.	Specific Gravity.	Illuminating Power.	Condensation.
June 10	·422	13·5	4·4	·410	12·5	4·1
11	·422	13·75	4·5	·405	12·5	4·1
12	·430	13·9	4·5	·407	12·8	4·2
14	·428	14·	4·6	·412	13·	4·4
15	·414	13·8	4·2	·408	12·5	4·1
16	·410	13·7	4·1	·400	12·5	4·
17	·402	13·25	4·	·406	12·6	4·
18	·405	14·1	4·75	·401	13·1	4·3
19	·380	12·5	4·	·398	11·9	3·8
21	·413	13·1	4·1	·403	12·25	3·9
22	·404	14·5	4·5	·404	13·2	5·
23	·404	13·8	4·5	·402	13·9	4·4
24	·407	15·6	4·7	·404	14·5	4·5
25	·402	14·5	4·4	·400	15·	4·75
26	·410	15·6	4·25	·404	14·9	4·5
28	·423	15·	4·5	·400	13·9	4·1
29	·415	14·6	4·25	·405	14·	4·
30	·402	14·5	4·25	·402	13·8	4·
July 1	·406	14·8	4·5	·401	13·7	4·25
2	·411	14·4	4·25	·400	13·3	4·
3	·411	15·2	4·3	·403	14·3	4·25
5	·409	15·1	4·25	·406	14·4	4·1
6	·405	14·9	4·35	·405	14·2	4·12
7	·418	15·2	4·5	·404	14·6	4·25
8	·422	14·7	4·25	·404	13·1	4·
9	·421	14·8	4·1	·408	13·7	4·

LEWIS THOMPSON.

No. 7 A, *Pancras-lane, City, July* 9, 1852.

THE BUNSEN PHOTOMETER.

SIR,—In reply to a letter from Mr. Edge, inserted in your valuable Journal of the 10th inst, I beg to say that I have never made any claim to being the originator of the fixed distance between the candle and the disc, not being aware of any novelty therein. The photometer manufactured by Messrs. Hulett and Co., with which my name is connected, embodies all that I have found valuable in practice; and is, I believe, an improvement upon those generally in use. An instrument with the disc and candle fixed so as to slide together, was used at these works in 1850, and was seen by M. Burel during the Exhibition of 1851.

SAMUEL CHURCH.

City of London Gas Light and Coke Company's Works, Dorset-street, Salisbury-square, June 19, 1852.

Register of New Patents.

CHARLES COWPER, of Southampton-buildings, Chancery-lane, "*for improvements in separating coal from foreign matters, and in apparatus for that purpose.*" (A communication.) Patent dated Dec. 8, 1851.

Claims.—1. An improved apparatus for separating coal from foreign matters. (In its general structure this apparatus is similar to that described in the specification of a former patent granted to Mr. Cowper, Nov. 2, 1849. See vol. i., p. 218.

2. The application of a stream of water in the apparatus for classifying the coal, and the application of a fixed or stationary bottom plate to the same apparatus, over which the dust is carried by the aforesaid stream of water.

3. The application in the water-sifting apparatus for purifying coal of a perforated sheet of gutta percha, supported by bars, or by a frame or frames.

4. A mode of causing the schist and other impurities to leave the water-sifting apparatus, and enter a chamber from which they issue in a continuous stream.

5. A mode of purifying the fine powder or dust of coal, by means of a peculiarly constructed labyrinth.

6. A mode of separating coal from foreign matters by means of a stream of water applied in the said apparatus.

ETIENNE ALEXANDRE ARMAND, of Paris, "*for improvements in the mode of distilling and treating organic substances and bituminous matters, and in the treatment of their products, together with the apparatus used for the said purposes.*" Patent dated December 19, 1851.

It is well known that when organic substances, such as wood, coal, fats, gum resins, horns, hides, and animal waste of all sorts, are heated in a closed vessel, decomposition ensues with the production of volatile bodies, which are sublimed, and of a solid residuum, which remains in the vessel; the same also occurs when bituminous ore is used, the residuum in this case, however, being the sandy or earthy substance which served as the basis of the ore, while, in the former case, it is charcoal more or less pure. The other products of this distillation are of various kinds, namely, gas and vapours, which are condensed into vinegar, water, essences, coal tar, &c.; and the proportions in which they are obtained will, of course, vary with the nature of the substances operated on.

Attention has been directed, in different trades, to the best modes of collecting increased proportions of certain of these products at the expense of the others; thus, the vinegar manufacturers use wood, which they distil at a low temperature, while gasmakers use coal at a high temperature, in order to obtain as large a proportion of gas as possible without producing ammonia or coal tar. Sometimes it is an object to produce oil and bituminous matters, and for this purpose bituminous ores, resinous substances, and the inferior descriptions of coal tar, are used. The invention of the patentee relates to the distilling of these substances, and is founded on the consideration that, the elements of the gas and tar being the same, it is possible to obtain the one from the other; that is, gas from tar, and from gas in contact with tar a liquid product rich in hydrogen, which, by dissolving in the tar, modifies its character. In this new system of working, the volatilized gases, instead of being condensed as usual, are made to pass through boiling tar, or hydrocarbonaceous matter, so as to obtain a reduced quantity of gas, and a new product by the absorption of part of the gas in the tar or tar-oil used.

The distillation of the bituminous matters is conducted as follows:—The matters are placed in cases, which are introduced into two or more open-ended retorts placed side by side in the same furnace. At both ends of the retorts are provided condensing apparatus, divided into three compartments, each containing pyrogenic oil of a specific gravity 0·90 to 9·96, which, during the working of the apparatus, is raised to different degrees of heat, and through which successively the gases, on escaping from the retorts, are caused to pass, so that portions are condensed therein, while the uncondensable gases are conducted away to a gasometer for being burnt or otherwise used. The condensing apparatus being so contrived that it shall be of different degrees of heat in the different compartments, the products contained in them will be found to be of various densities—the lighter and most volatile being in that part of the condensing apparatus where the temperature is lowest, and the heavier products being in that where the heat is more directly applied. When the nature of the working will not admit of the above apparatus being used—as, for instance, in manufacturing coke—the gases may be caused to traverse a vertical shaft full of pebbles, through or among which the hot oil is caused to trickle. The products obtained by this operation would be treated the same as those from the process just described.

The use of a closed case with side openings, such as used for distilling liquid substances, may be preferable to open cases for the working of bituminous or asphaltic solid ore. In treating such, the patentee adds about 10 per cent. of light oil, and heats the retort to 390 deg. The oil dissolves the bituminous matter, and vapours are formed, and the liquid forced from the cases into receivers, where it is concentrated. When no more liquid comes over, the case is withdrawn, and will be found to contain only the earthy basis of the ore.

For the purpose of purifying and decolorising the light oils thus obtained, the patentee adds to them about one per cent. of nitrous sulphuric acid, which is poured gradually in, so as to prevent heating of the mixture, the oil being kept the while in a state of agitation. After a short time the oil clears itself, and the colouring matter is deposited; the oil is then decanted, and washed, first with lime-water, and afterwards with water alone, after which it is distilled in combination with a concentrated saline solution (composed of equal weights of an alkaline chloride and nitrate, such as seasalt and saltpetre), in order to absorb any sulphurous acid that may still remain in it, and to produce steam, by which the distilling operation is found to be facilitated. For the purpose of conducting this process, the patentee makes use of a modification of the calcining apparatus before mentioned. Instead of using nitrous sulphuric acid for rectifying the light oil, concentrated sulphuric acid, with peroxide of manganese, may be employed, or acid and permanganate, or chromate of potash, or any suitable oxidizing body. Instead, also, of the above-mentioned saline solution, a melted mixture of anhydrous lime and potash may be substituted, and the oil caused to come in contact with the same, which is well adapted for combining with any sulphurous acid and clearing the oils.

The heavy oils are treated by mixing them with about 1 per cent. of nitrous sulphuric acid, or of the above oxidizing mixtures, and allowing them to stand for a short time. The liquor is then decanted, and washed repeatedly with warm lime-water, after which the oil is mixed with about 3-7ths by weight of fixed oil, such as rape oil, &c., with the addition of about 2 per cent. of the oxidizing mixture. The whole is then agitated until it becomes of a rich violet colour. The patentee now again uses weak lime solution, or steam, which precipitates the sulphurous acid, and he filters the liquid, when the oil will be found to have become of a yellow colour, and perfectly transparent. The separation of the acid is a slow process, and to effect it perfectly it is necessary to wash repeatedly, and allow the mixture to stand two or three days after each washing. Another process for treating these heavy oils is as follows:—The patentee mixes the fixed oils after the second addition of oxidizing matter, and he then decants the liquor, washes it with slightly alkalized water, and places it in a sand bath heated to about 390 deg. Fahr. for about six hours.

The heaviest oil may, without any preparation, be used as a grease for machinery and carriages, or it may be distilled to any required degree of concentration. A solid grease may be produced by mixing the heaviest oil with about 10 per cent. of resin, or of a fixed oil or fat, and treating the mixture with a solution of lime and potash, or lime and soda, at a heat of 212 deg. Fahr., and agitating continually until the mixture becomes mixed. When cold, the compound grease is of a brown colour, and fit for greasing carts or railway carriages.

Claims.—1. A mode of calcining or distilling solid organic substances or bituminous matters, by placing the same in earthenware or metal cases, and introducing the cases into the retorts, instead of placing the substances directly into the retorts.

2. A mode of collecting the volatile products from the calcination, by which the said products are made to pass through hot pyrogenic oil, whereby a part of the uncondensable gas is transformed into condensable vapours, and those vapours are condensed into liquids of different densities by passing through vases differently heated.

3. The several described methods of treating the light oils, heavy oils, and bituminous matters, by means of the specified chemical processes when working the apparatus, described.

4. A mode of distilling any kind of liquid organic substance and bituminous matter, similar to that claimed for dry substances, but with this difference, that, instead of placing inside the retorts open cases containing the solid substance, a closed case inside the retort, with suitable openings, is employed, the said case being connected by any suitable providing contrivance, such as described, with the vessel containing the liquid substances, which is preferred to be placed outside the retort; and, further, a particular contrivance for heating the liquid substance on its way from the reservoir in the case.

Legal Intelligence.

BROMPTON COUNTY COURT,

June 16, 1852.

THE IMPERIAL GAS COMPANY *v.* BARRETT, TAYLER, AND PORTCH.

These cases came on for trial this day before Mr. Maude, who sat for Mr. Amos, the judge of the Brompton County Court.

Mr. Cox appeared as solicitor to the Imperial Gas Company, and stated that the question was of great importance to the plaintiffs, who had bound themselves to supply the defendants with gas, so long as they conformed to the conditions of the contract, until the company should have given written notice to the consumer of their intention to discontinue such supply, to expire at the end of the quarter next ensuing the date of such notice; and the defendants on their part had, by the eighth condition of the contract, entered into the same condition with the company; and this action was brought for a breach of that condition—not committed willingly by the defendants, but who were prevailed on to do so by the Western Gas Company; in proof of which they were not defended by their own solicitor, but by the solicitor and secretary of the Western Company, who, not satisfied with having used all possible technical arguments on a former occasion, thought it fitting, instead of paying these just claims of the plaintiffs, to take the chance of another decision. Mr. Cox expressly stated that, under ordinary circumstances, the plaintiffs never enforced this condition, or any other of the penal clauses of the contract, but were always willing to take a liberal view of the circumstances of each particular case, and act accordingly; but finding in the present case that this was neither the act of the consumers, nor the effect of *fair* competition on the part of a rival company, but a course of dealing not at all to be justified, they felt bound to adopt the present proceedings, and he (Mr. Cox) had no doubt that his Honour would, not only in law, but in justice and equity, find for the plaintiffs.

Evidence was then given, on the part of the plaintiffs, of the various contracts; that the defendants had not given the notices required by the contracts to discontinue the supply, but that, in lieu thereof, printed notices belonging to the Western Company were served by the officers of that company, in some instances after they had taken upon themselves to interfere with and disconnect the service from the plaintiffs' mains. It was also proved that in all cases a copy of the contract was left with the consumer at the time he signed the same. In one instance it was necessary to call a Mr. Newton (a former inspector of the plaintiffs, but now in the service of the Western Company) as a witness, who gave his evidence somewhat reluctantly, and failed to establish the signature of the defendant to the contract, although, after much hesitation, he said he *supposed* it was his duty to obtain such signature; and the plaintiffs were consequently obliged to call the defendant himself to prove his own signature.

Mr. Barber, the solicitor to the Western Company, and who appeared as solicitor for the defendants, commented upon the nature of these proceedings, and the stringent character of all the conditions endorsed on the contract, which were all in favour of the company—providing even that the consumer should pay the expense of laying on the gas, including the service-pipe, and repairing the pavement, and yet that the service-pipe should be the property of the company and removable by them; that there was no agreement that the company would continue to supply gas of any given quality, or any gas at all, and no remedy provided for the consumers if the gas were bad or the supply were discontinued by the company. He (Mr. Barber) contended that the contract was void for want of mutuality, and quoted authorities in support of his view. If one party were not bound on his part to do the act which forms the consideration for the promise of the other, the agreement is void. Mr. Barber argued, secondly, with regard to the particular condition in question, that the words would not bear the meaning sought to be put upon them by the plaintiffs; that they were, in fact, absurd, as every notice given at all must be a notice given three months before the end of the then next ensuing quarter, namely, of the quarter of a year which has not commenced, and, that being absurd, it was not competent for the court to import sense into them. The rule of law being held in the case of Hotham *v.* the East India Company to be, that all latitude of construction must submit to this restriction, viz., that the words and language of the instrument will bear the sense sought to be put upon them. Arguments in addition occurred in the case of Mr. Barrett, whether the agreement could be received without being stamped, and whether a letter from the defendant to the plaintiffs, giving notice that he should discontinue their gas if the light was not improved, had been withdrawn by the defendant, or must be considered as continuing in existence up to the time the gas was finally cut off.

The Learned Judge said that Mr. Barber's objections had nothing at all to do with the case before the court; and that, although the words in the contract might have been more explicit, yet their import was obvious, and the plaintiffs were entitled to recover. The verdict must, therefore, be for the plaintiffs in all the cases except against Portch, who was not in court upon being called as a witness to prove his transfer signature, although present a few minutes before, at the discussion of the previous cases.

Miscellaneous News.

CURIOSITIES OF CHEMICAL EVIDENCE OF THE ILLUMINATING POWER OF GAS.

(*Continued from page* 275.)

Thomas Graham, Esq., F.R.S., examined by Mr. Wilde.

You are a Fellow of the Royal Society, and Professor of Chemistry at the London University?—Yes.

And have written, I believe, a very large work on chemistry, have you not?—I have written a systematic work on chemistry.

Have you lately been employed by Government in any chemical investigations?—I am employed at present in an investigation on the use of lead in refining sugar.

With reference to public health?—With reference to public health.

You have heard Dr. Leeson give his evidence, and you were present on the occasions when he examined the gas; do you concur in what he says as to the illuminating power of the gas on those occasions?—I quite concur. I agreed, in fact, in the terms of our report.

Committee: That is to say, in the experiments on the 22nd?—Yes.

Mr. Wilde: On that occasion were not the chimney and burner of the particular ascertained class and size used, which you have mentioned in your report, as being the chimney and burner you did use?—Yes.

Were those well chosen and well adapted for trying the experiment fairly?—I believe so.

What do you say on the subject of the ammonia; the litmus paper, I suppose, tests the presence of ammonia. What do you say as to the rapidity with which it changes colour?—The rapidity of change is an intimation of the relative quantity.

And it must be present, I suppose, in considerable quantities, to turn the litmus paper blue?—Yes, to turn it instantly.

As to Mr. Croll's process of purifying gas, have you had your attention directed to it?—Yes, I have had an opportunity of studying the plans.

You have had the working plans and Mr. Croll's statement?—Yes.

Supposing the new works under Mr. Croll's process are worked with coke, which they are proposed to be, I believe, instead of coal or tar, what effect will that have in reducing the quantity of smoke produced by the works?—It would prevent any opaque smoke being thrown into the atmosphere.

That is part of his plan, is it?—That is part of his plan.

I need hardly ask you if it would be very much less injurious to the neighbourhood, than where there is a large quantity of smoke?—Undoubtedly.

What are the chief offensive exhalations that proceed from gas works?—The ammonia, which is often improperly exposed, and the sulphuretted hydrogen from the waste lime.

Those, then, ammonia and sulphuretted hydrogen, are the two most prejudicial exhalations that come from gas works?—Yes.

The sulphuretted hydrogen, I think you say, comes from the waste lime which has been used for the purposes of purifying?—Yes.

Under the ordinary processes used by other companies?—Yes.

I believe I shall be right in saying that some of the companies at present use coke with that view; or, at least, it has that effect, with the view of preventing smoke?—I am not aware of that.

You do not know what the other companies do?—No.

What means are taken in Mr. Croll's process, which will avoid the exhalation of sulphuretted hydrogen from the waste lime?—The sulphuretted lime is exposed to a flame, the waste heat of the furnaces.

What sulphuretted lime is produced is exposed to the waste heat of the furnaces whereby the sulphuretted hydrogen is destroyed?—Yes.

Does part of Mr. Croll's process tend to diminish the quantity of sulphuretted lime produced?—He uses chloride of zinc or chloride of manganese for the purpose of purifying the gas, for the purpose principally of arresting the ammonia.

Does that also arrest the sulphur?—That arrests the sulphur at the same time.

Therefore a less quantity of lime is necessary?—A less quantity is necessary.

And that which is used, I understand you, is deprived of its noxious power by being exposed to heat?—By being exposed to a very strong heat.

Is the result, then, of the use of chloride of maganese, and dealing with the sulphate of lime in the way you have described, is the result that a much less quantity of sulphate of lime will be produced than ordinarily?—Much less produced, and what is produced destroyed.

I believe there is a great difficulty in the present system of making gas in disposing of this sulphate of lime?—There certainly is.

The lime takes up the sulphur from the gas; but you cannot get rid of the lime without setting free a large quantity of sulphuretted hydrogen?—Exactly.

What is done with it generally; thrown into the Thames, or what is done with it?—I do not know.

If it gets into the sewers or drains, would it be productive of great damage and public annoyance?—On reaching the river it certainly would contaminate the river.

When it comes in contact with water, it would produce the gas called sulphuretted hydrogen, would it not?—It would. There would be an exhalation of gas.

I believe you attended upon the Board of Health, with some other persons, upon the subject of this new process?—I did on the 27th.

And explained to the board what you are now explaining to the committee—that it would produce much less public evil?—Yes; that it was a beneficial process in a sanitary point of view.

In reference to this company?—In reference to this company.

May I ask you whether gas works are better at Bow, in a sanitary point of view, than they are in the City?—They are, certainly.

Cross-examined by Mr. TALBOT.

Do you propose to pull the City gas works down? You have, I suppose, hardly contemplated that?—I have not.

Pray, what is it that you have been describing—this process of coke and sulphuretted hydrogen, and all the rest of it—what is it that you have been describing?—It is the working plans proposed for the new establishment, as they were submitted to me.

Working plans proposed for the new establishment as submitted to you by whom?—By Mr. Croll and other parties.

Then is the mode which you have been detailing depending upon plans, or upon some chemical agencies, for the purification of gas, or what is it?—It depends upon chemical agencies.

It depends upon chemical agencies. The plan has nothing to do with it, has it?—My information of it is principally derived from the plan; that is, the combination of the parts.

But is it a peculiar plan of Mr. Croll is what I want to know?—I should say that the combination of the different parts is peculiar.

Is there anything so peculiar in it, if it is worth anything, as to preclude the adoption of the same system in other gas works?—I am not aware to what extent the different parts of the process have been patented.

Whether it is a patent or not, do you not know?—Why, the different parts are all several steps, each of which may be the subject of a patent.

But to what extent it is patented you do not know?—No.

But I suppose a gas manufacture patent is intended for use, as other patents are?—Yes.

Supposing it to be worth the paper the specification is written upon, there is no difficulty in other companies adopting it, upon terms with the patentee?—No; certainly not.

Do I understand you that you were present upon the 1-candle-burning occasion?—I was.

Where was that?—At Guildhall.

At the Guildhall Coffeehouse?—Yes.

Who furnished you with the chimney and burner upon that occasion?—The chimney and burner were those belonging to the apparatus, and used in all the experiments, and retained as the standard, which will be used in any future experiments.

Which will be produced here to-day?—That I cannot say.

Who furnished the apparatus upon that occasion?—It was furnished by Mr. Croll. Here it is (the same being produced).

Where is the chimney?—It does not appear to be there.

Do not you know that the chimney will make all the difference?—I believe we use the same chimney.

You believe you use the same chimney on all occasions?—Yes.

Then I asked a question of you, to which you have not favoured me with a reply—whether you did not know that, in the measurement of these matters, the height and dimensions of the chimney will make all the difference? I put that question to you in the presence of a number of scientific gentlemen, and I should like to have an answer. Would the length of the chimney make any difference in those photometrical experiments?—I should think not much.

Would it make any difference?—It would make a little difference.

The chimney you have not produced?—I was not aware that anything was to be produced.

Did it ever occur to you where to measure 1-candle gas before?—Never.

You never saw gas anything like so bad, did you, as that burning upon that occasion?—Yes; I have seen gas as bad; but I had no occasion to measure it.

I understand you, Professor Graham, in common with Dr. Leeson, are to enjoy the privilege of a high post under the present proposed company. Is not that so?—I understood that our office was to protect the public.

You understood that your office was to protect the public. Be it so. It is an office to which you are appointed by the goodwill and favour of the gentlemen the promoters of this scheme, is it not?—Undoubtedly.

Will you have the goodness to tell me, should you esteem 14-candle gas good?—Certainly; very good.

Should you esteem gas, of which ammonia constituted a $\frac{1}{52000}$th part, good?—It is difficult to state. I am not aware that any determination has been made of the exact proportion of ammonia that is safe in gas.

Whether it is safe or not, I do not suppose entire freedom from ammonia is practicable, is it?—No.

Then, supposing the proportion of ammonia to be a $\frac{1}{52000}$th part, is that, or not, good gas?—There was an occasion on which I myself have found the proportion was smaller than that.

What proportion was it?—I think it was about 1 in 1,000,000.

That must have been a very close analysis?—It was.

COMMITTEE: If you can arrive at 1 in 1,000,000, and test 1 in 1,000,000, you can surely tell us what you think of the merits of 1 in 52,000?—I should be inclined to suppose that was a high proportion.

You would consider that a large quantity of ammonia?—Yes, in the case of gas as furnished to the consumer.

Mr. TALBOT: Will you tell me, as a matter on which we may have a personal interest, where was the gas, of which one millionth only was ammonia?—It was one of the City gases.

What! a City gas company; one of those burning in the City, was it?—Yes, it was upon that occasion.

Upon that same occasion?—No, upon another much more recent occasion.

Upon another much more recent occasion you found a millionth part of ammonia?—Yes.

Pray, upon any of those occasions, did you take the specific gravity?—I did not.

Time was, in my younger days, I think, when that was considered a test of gas, was not it?—It is, to a certain extent, a test of gas.

Am I using your words rightly, "It is, to a certain extent, a test of gas?"—Yes.

At all events, you did not take it upon any occasion?—No.

It is a simple process, is it not?—No, it is not by any means simple, at least the apparatus.

It is as simple as finding out the millionth part of ammonia, is not it?—Oh, much more so.

Will you have the goodness to let me look at one of your candles. [The same was handed to the learned counsel.] Is this one of them?—I take it for granted, from finding them here. I have a register of it.

Mr. HILL: You have the register of it?—I have.

Mr. TALBOT: Was the candle by which you conducted your experiments in that spring affair that we see there [pointing to the photometer]?—Yes, it was; the object of it was to keep it to the same height.

Has that, like a carriage lantern, a spiral spring?—Yes.

Re-examined by Mr. HILL.

You say the specific gravity is to a certain extent a test of gas; what is it a test of?—The richest portions of the gas are of high specific gravity, but, at the same time, one of the most injurious gases which can enter coal gas is of a high specific gravity also; so that, unless an experiment on specific gravity is combined with an analysis, it may lead to fallacious results.

Having conducted the experiment on the principle on which you conducted it with a given flow of gas, through a given number of holes of a given diameter, and into a given chimney, would it have enabled you to present a better report, a fairer report, a more accurate report, if you had taken the specific gravity of that gas?—My impression is, that there is little use in taking the specific gravity unless it is repeated several times; and, taken in conjunction with an analysis of the gas, I do not conceive we could at the time have added to our information.

Now, in this case in which you found gas which was of 1-candle power, might that have been produced by the admission of atmospheric air?—It might have been so. A very small admission of atmospheric air diminishes the illuminating power of the gas.

That would, at the same time, heighten the specific gravity, would it not?—It would heighten the specific gravity. That is one of the fallacies.

Having had your attention called by my learned friend to the question of specific gravity, is any doubt cast upon your own mind of the accuracy of the test to which you submitted the gas, because you did

not enter into the question of specific gravity?—No; the results are complete in themselves.

You said that 1 in 52,000 would be a high proportion of ammonia, and would produce, as far as ammonia is concerned, an impure gas?—I speak from an impression rather.

So I understand you to speak from impression, and you say this case in which you found gas which had only one millionth part of ammonia was taken recently. How recently?—It was taken, I think, at the end of January.

When it was found that that chimney was not in the box, then there were many questions asked upon the chimney. Was the chimney the common chimney used for gas burning?—The common chimney.

Was it a 7-inch chimney?—I should say 7 or 8 inches.

At all events, was the same chimney used in each of the experiments?—The same entire apparatus.

Does anything in your mind turn upon the question of the chimney, considering that you used the common chimney used in burning gas, and that you used the same chimney on each of the experiments?—Nothing sensible.

Have you any reason to suppose that the gas was tampered with?—Not the smallest reason for supposing such a thing.

Would it be easy, without a very cumbrous conspiracy, for the parties to tamper with the gas so as to produce an effect?—I should think not. It could not be done by any means easily. The experiment lasted for an hour perhaps, and a considerable quantity of gas was consumed during that period.

Committee: Did you examine the pipe at the Guildhall Coffeehouse on the day on which the amount of gas was so extremely defective?—I did not; but I observed the whole house was equal in darkness. My impression was that the night was foggy. I observed that there was a darkness.

Your impression was that it was a foggy night. What had that to do with the defectiveness of the gas?—The light was not so strong in the house itself. In the public room they were burning gas, but the gas was not giving nearly so much light as usual.

If gas, from being mixed with atmospheric air, or from any other reason, does not come on so pure as it should be, we have been told that that might be made up for by turning the cock wider open. Did you take the trouble to examine whether the pipes on this occasion were turned unusually wide open?—I did not; but I observed the burner in the room—that was removed—was one which admitted of a great blaze: either the holes had been opened, or it was originally made so as to allow a much greater quantity of gas to escape than is usually allowed with such a burner.

We have been told that there was the average amount of light, although the gas was very defective, and we have been told that that is to be accounted for by a larger quantity of gas being burned on that occasion by the pipe being unusually widely opened; but the previous witness did not examine the pipe, to see whether it was, in point of fact, widely opened. Did you take the trouble to do so?—No.

Mr. Hill [through the Committee]: Would the widening the holes of the burner have a similar effect to widening the pipe or opening the cock, by giving a greater facility of exit to the gas?—The widening of the apertures would have the same effect undoubtedly as opening the cock.

Committee: Do you mean to represent to us that this burner which you noticed was so unusually wide in its apertures, that it would let out nine times the usual quantity of gas?—I should not suppose so much as nine times; but it certainly would have allowed to escape four or five times the usual quantity I have no doubt. My attention was particularly drawn to the burner at the time.

Then, on an ordinary night, when the gas was at its usual power, that burner would operate to consume four or five times as much gas as necessary?—It would produce then a smoky flame, so that any person would be induced to reduce the flame, to adjust it so as to produce a flame without smoke; when the gas is rich, the same quantity of gas produces a smoky flame.

You are not supposing, are you, that, although the gas was only 1-9th of its usual power, the room could be as light as it usually is?—The room did not appear to me to be as light as it should be. I stated that.

Mr. Hill [through the Committee]: When you removed the Guildhall burner, and applied your own burner, was not there a very perceptible diminution of light?—Yes, a diminution.

In the case of a person lighting a gaslight like that at the Guildhall Coffeehouse public rooms, has he not the means, by a cock near to the burner, of letting in gas so as to adjust the quantity of light which he requires, according to the state of the gas in the pipe?—Yes, it can be adjusted, and is habitually adjusted.

Committee: But how the pipe was adjusted on this occasion neither you nor Dr. Leeson examined?—How the burner was adjusted?

How the cock close to the burner was adjusted on this night, I understand you to say; and I also understood Dr. Leeson to say that no notice was taken?—In the room where we made the examination, my impression is that the gas was lighted for us.

Can you tell me at all at what angle the cock was to the pipe at the time you were making the examination?—No.

How was it that, if the gas was only 1-9th of its usual strength, the room at the Guildhall was illuminated at all in the way in which it is ordinarily illuminated before your experiment began?—My observation was, that it was not illuminated so strongly as I had seen it.

But was the deficiency of light at all in the proportion of 1 to 9?—I should think not; there might be 1-4th.

Mr. Hill [through the Committee]: Was your attention called to the state of the cock until you had employed your own apparatus, and then it would be too late?—It was not.

You were surprised, I suppose?—I was.

You were extremely surprised?—Yes.

And you discarded the experiment from the average?—Yes.

Committee: You were saying that there was this foggy appearance in the room. Was that, do you conceive, caused by fog in the room or the want of light?—By the deficiency of light.

You meant to ascribe the foggy appearance as arising from the want of a sufficient supply of gas?—Yes.

Not from a foggy night?—No; it produces a singular effect.

[*The witness withdrew.*]

The Great Central Gas Company and Messrs. Tallis and Co. This cause was set down for trial at the sittings of the Court of Exchequer at Guildhall on the 5th instant, but has been postponed till the 10th, to suit the convenience of the counsel engaged.

The Inventor of the Hydro-Carbon Gas.—A claimant to the invention of this process, whose name has been hitherto unknown to the English public, has just appeared in M. Jobard, the director of the Royal Museum of Industry of Brussels, who has published documents which prove beyond all doubt that he was the true inventor of the system patented in France by Selligue in 1834, and at a later period by Val Marino, in England. M. Jobard's Belgian patent is dated Feb. 22, 1834; and, therefore, takes precedence of all others for the manufacture of water gas, except Donovan's, of Oct. 6, 1830.

Rio de Janeiro.—The last Brazil mail brought the melancholy intelligence of the death by yellow fever of 11 out of the staff of 17 persons, lately sent out to direct the erection of the gas works in that city. The engineer has returned to this country to fill up the vacancies thus caused in his ranks.

BALANCE SHEET OF THE AUCHTERMUCHTY (N.B.) GAS COMPANY,

For the Year ending April 30, 1852.

Expenditure.	£ s. d.	£ s. d.
Balance due by company, April, 1851		0 5 7
New meters		58 11 8
(Note.—Total expenditure for meters, £720. 18s. 7d.)		
Gas coal	122 14 4	
Carriage of gas coal	43 13 5½	
		166 7 9½
Furnace coal	18 19 2	
Carriage of furnace coal	21 15 3½	
		40 14 5½
Lime	3 18 0	
Carriage of lime	3 0 0	
		6 18 0
Blacksmith	3 3 9	
Tinsmith	0 5 0	
Inverkeithing brickwork	0 12 2	
		4 0 11
Poor rates	1 13 2	
Property and income tax	2 18 4	
Assessed Taxes	0 8 9	
		5 0 3
Interest	2 18 3	
Weighing	1 0 0	
Flue covers, and building retorts	2 16 3	
		6 14 6
Manager's and assistant's salaries		45 16 7
Clerk and treasurer's salaries, &c.		10 16 6
Manager's petty disbursements		6 6 7
Sundry expenses for the previous year		36 13 4
Balance in hands of the Branch of the Western Bank of Scotland		49 17 2
		£528 3 4

Receipts.	£ s. d.	£ s. d.
Arrears at April 30, 1851	4 0 8	
Less bad	0 5 5	3 15 3
Gas sold at 9s. 2d. per 1000 feet	468 2 8	
Interest of meters	53 2 6	
	521 5 2	
Deduct arrears	22 0 7	498 4 7
Coke sold	24 0 10	
Ashes sold	0 2 0	
		24 2 10
Fire brick		0 0 6
Old arrears		0 5 8
Ground rent		0 15 0
		£528 3 4

STOCKPORT BOROUGH GAS WORKS.

THE ANNUAL ACCOUNT OF RECEIPTS AND EXPENDITURE FOR 1851.

Dr. RECEIPTS.	£ s. d.	£ s. d.
To amount received for gas rents		8727 0 7
Amount do. public lamps		1530 10 6
Amount do. meters and fittings		856 17 6
Amount do. coke		525 9 7
Amount do. tar and spent lime		190 2 0
To balance due to Treasurer, Dec. 31, 1851		7889 19 10
		£19,720 0 0

Cr. PAYMENTS.	£ s. d.	£ s. d.
By balance due to Treasurer, Dec. 31, 1850		7693 7 2
Gas Department.		
By wages to stokers, labourers, bricksetters, fitters, &c., including salaries	1659 12 10	
Cannel, coal, &c.	2970 14 6	
Cartage of cannel	152 3 6	
Lime for purifying	137 9 7	
Oil, ropes, &c.	7 1 6	
Ironmongery, &c.	35 10 4	
Braziery	4 7 0	
Fittings, lead pipe, &c.	28 1 0	
Retorts	182 17 3	
Stationery	40 8 2	
Wood work	1 4 0	
Sundry small payments	45 2 5	
		5264 12 1
Lamp Department.		
By wages for lighting, extinguishing, and keeping in repair 699 lamps throughout the entire year	276 1 9	
Glazing	29 3 10	
Braziery and lamps	26 7 6	
Fittings	21 14 8	
Iron, &c.	7 10 0	
Joiners' work	7 4 6	
Sundry small payments	4 13 6	
Oil, waste, &c.	10 3 11	
		382 19 8
Meters and Fittings.		
By wages	105 2 7	
Meters	377 19 6	
Iron work	23 12 4	
Fittings, lead pipe, &c.	83 1 10	
Glazing	3 10 0	
Braziery	65 8 9	
Sundry small payments	17 13 7	
		676 8 7
Maintenance of Works.		
By wages for repairs and alteration of works	129 3 5	
Wages, for repairs of old pipes, taking up old pipes, and laying larger in their places	278 1 0	
Timber and joiners' work	21 0 0	
Brick and stone work	15 5 0	
Ironmongery, castings, &c.	148 1 6	
Oil, ropes, &c.	20 14 6	
Lead piping, fittings, &c.	0 0 0	
Glazing and painting	13 10 5	
Cartage	5 18 3	
Sundry small payments	10 14 3	
		642 8 4
EXTENSIONS OF SERVICES AND MAINS.		
Service Pipes.		
By wages	434 6 1	
Joiners' work, timber, &c.	20 7 0	
Ropes, oil, &c.	33 17 0	
Lead piping, fittings, &c.	82 19 1	
Ironmongery, &c.	21 8 6	
Sundry small payments	8 1 7	
Mains.		
New mains	1165 5 0	
Paving after mains	4 14 4	
Lead, oil, red lead, &c.	26 0 6	
Sundry small payments	7 5 0	
		1804 4 1
EXTENSIONS—HEATON NORRIS.		
By wages	191 15 3	
Ironwork, &c.	133 6 1	
Stone and stone work	79 18 0	
Timber and joiners' work	75 7 6	
Plumbing and other lead work	75 7 8	
Slate and slating	15 0 0	
Market-house roof	124 17 2	
Land purchased from railway company	187 10 0	
Brass fittings	2 10 0	
Castings	514 6 3	
Brick work and lime	30 2 6	
Sundry small payments	2 17 9	
		1432 18 2
By rents, taxes, &c.		310 1 3
Interest and commission		1514 0 8
		£19,720 0 0

THE STOCKPORT GAS WORKS IN GENERAL STOCK, SHOWING LIABILITIES AND ASSETS, ON DECEMBER 31, 1851.

Dr. LIABILITIES.	£ s. d.	£ s. d.
Jan. 1, 1852.		
To council of the borough, for amount of original mortgage debt		26,700 0 0
Tradesmen's accounts owing for materials for gas-making (including John Bleasdale's debt)	3,543 15 10	
Tradesmen's accounts owing for materials at Heaton-lane	44 3 6	
Tradesmen's accounts owing for materials for extensions and mains	832 9 9	
Tradesmen's accounts owing for wear and tear	91 0 10	
Disputed accounts	217 10 4	
		4,729 0 3
Balance due to treasurer		7,889 19 10
		39,319 0 1
Balance in favour of the works		2,855 17 9
		£42,174 17 10

Cr. ASSETS.	£ s. d.	£ s. d.
By value of the works on Jan. 1, 1852		33,587 19 6
Depreciation, 3½ per cent.	1,175 11 7	
Expended upon maintenance of works	612 8 4	
		533 3 3
		33,054 16 3
Tradesmen's accounts, for wear and tear, as per contra		91 0 10
Extensions, Heaton Norris, as per cash payments	1,432 18 2	
Ditto, ditto, Tradesmen's accounts [See last year's account]	803 11 4	
		629 6 10
Ditto, ditto, Tradesmen's accounts, as per contra	44 3 6	44 3 6
Extensions of mains, as per cash payments	1,804 4 1	
Ditto, ditto, Tradesmen's accounts [See last year's account]	190 14 2	
		1,613 9 11
Ditto, ditto, Tradesmen's accounts, as per contra	832 9 9	832 9 9
Stock of working materials		905 1 8
Debts due for gas	4,467 11 11	
Ditto ditto fittings	138 18 7	
Ditto ditto coke, &c.	123 18 7	
		4,730 9 1
Debt due from the late Mr. Steel		274 0 0
		£42,174 17 10

(*Memorandum.*)

	£ s. d.
Balance in favour of works, 1851, as per the above account	2,855 17 9
Add discounts from gas rents, before carrying forward the balances, which have hitherto been deducted in the following year, and by which the discounts for *five* quarters have been charged to the rental account of 1851	243 10 4
	3,099 8 1
Balance in favour of works, 1850, as per last account	1,033 9 6
Actual profit for 1851	£2,065 18 7

THE NEW PATENT LAW AMENDMENT ACT.

15 & 16 Vict., cap. 83.—July, 1852.

Whereas it is expedient to amend the law concerning letters patent for inventions, be it enacted by the Queen's most excellent Majesty, by and with the advice and consent of the Lords spiritual and temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:—

I. The Lord Chancellor, the Master of the Rolls, her Majesty's Attorney-General for England, her Majesty's Solicitor-General for England, the Lord Advocate, her Majesty's Solicitor-General for Scotland, her Majesty's Attorney-General for Ireland, and her Majesty's Solicitor-General for Ireland, for the time being respectively, together with such other person or persons as may be from time to time appointed by her Majesty, as hereinafter mentioned, shall be Commissioners of Patents for Inventions; and it shall be lawful for her Majesty from time to time, by warrant under her royal sign manual, to appoint such other person or persons as she may think fit to be a commissioner or commissioners as aforesaid; and every person so appointed shall continue such commissioner during her Majesty's pleasure; and all the powers hereby vested in the commissioners may be exercised by any three or more of them, the Lord Chancellor or Master of the Rolls being one.

II. It shall be lawful for the commissioners to cause a seal to be made for the purposes of this act, and from time to time to vary such seal, and to cause to be sealed therewith all the warrants for letters patent under this act, and all instruments and copies proceeding from the office of the commissioners, and all courts, judges, and other persons whomsoever, shall take notice of such seal, and receive impressions thereof in evidence, in like manner as impressions of the Great Seal are received in evidence, and shall also take notice of and receive in evidence, without further proof or production of the originals, all copies or extracts certified under the seal of the said office, of or from documents deposited in such office.

III. It shall be lawful for the commissioners from time to time to make such rules and regulations (not inconsistent with the provisions of this act) respecting the business of their office, and all matters and things which under the provisions herein contained are to be under their control and direction, as may appear to them necessary and expedient for the purposes of this act; and all such rules shall be laid before both Houses of Parliament within fourteen days after the making thereof, if Parliament be sitting, and if Parliament be not sitting, then within fourteen days after the next meeting of Parliament; and the commissioners shall cause a report to be laid annually before Parliament of all the proceedings under and in pursuance of this act.

IV. It shall be lawful for the Commissioners of her Majesty's Treasury to provide and appoint from time to time proper places or buildings for an office or offices for the purposes of this act.

V. It shall be lawful for the commissioners, with the consent of the Commissioners of the Treasury, from time to time to appoint for the purposes of this act such clerks and officers as the commissioners may think proper; and it shall be lawful for the commissioners from time to time to remove any of the clerks and officers so appointed.

VI. Every petition for the grant of letters patent for an invention, and the declaration required to accompany such petition, shall be left at the office of the commissioners, and there shall be left therewith a statement in writing, hereinafter called the provisional specification, signed by or on behalf of the applicant for letters patent, describing the nature of the said invention; and the day of the delivery of every such petition, declaration, and provisional specification shall be recorded at the said office, and endorsed on such petition, declaration, and provisional specification, and a certificate thereof given to such applicant or his agent; and all such petitions, declarations, and provisional specifications shall be preserved in such manner as the commissioners may direct, and a registry thereof and of all proceedings thereon kept at the office of the commissioners.

VII. Every application for letters patent made under this act shall be referred by the commissioners, according to such regulations as they may think fit to make, to one of the law officers.

VIII. The provisional specification shall be referred to the law officer, who shall be at liberty to call to his aid such scientific or other person as he may think fit, and to cause to be paid to such person by the applicant such remuneration as the law officer shall appoint; and if such law officer be satisfied that the provisional specification describes the nature of the invention, he shall allow the same, and give a certificate of his allowance, and such certificate shall be filed in the office of the commissioners, and thereupon the invention therein referred to may, during the term of six months from the date of the application for letters patent for the said invention, be used and published without prejudice to any letters patent to be granted for the same, and such protection from the consequences of use and publication is hereinafter referred to as provisional protection: provided always, that in case the title of the invention or the provisional specification be too large or insufficient, it shall be lawful for the law officer to whom the same is referred to allow or require the same to be amended.

IX. The applicant for letters patent for an invention, instead of leaving with the petition and declaration a provisional specification as aforesaid, may, if he think fit, file with the said petition and declaration an instrument in writing under his hand and seal (hereinafter called a complete specification), particularly describing and ascertaining the nature of the said invention, and in what manner the same is to be performed, which complete specification shall be mentioned in such declaration, and the day of the delivery of every such petition, declaration, and complete specification shall be recorded at the office of the commissioners, and endorsed on such petition, declaration, and specification, and a certificate thereof given to such applicant or his agent, and thereupon, subject and without prejudice to the provisions hereinafter contained, the invention shall be protected under this act for the term of six months from the date of the application, and the applicant shall have during such term of six months the like powers, rights, and privileges as might have been conferred upon him by letters patent for such invention issued under this act, and duly sealed as of the day of the date of such application; and during the continuance of such powers, rights, and privileges, under this provision, such invention may be used and published without prejudice to any letters patent to be granted for the same; and where letters patent are granted in respect of such invention, then in lieu of a condition for making void such letters patent in case such invention be not described and ascertained by a subsequent specification, such letters patent shall be conditioned to become void if such complete specification, filed as aforesaid, does not particularly describe and ascertain the nature of the said invention, and in what manner the same is to be performed; and a copy of every such complete specification shall be open to the inspection of the public, as hereinafter provided, from the time of depositing the same, subject to such regulation as the commissioners may make.

X. In case of any application for letters patent for any invention, and the obtaining upon such application of provisional protection for such invention, or of protection for the same, by reason of the deposit of a complete specification as aforesaid in fraud of the true and first inventor, any letters patent granted to the true and first inventor of such invention shall not be invalidated by reason of such application, or of such provisional or other protection as aforesaid, or of any use or publication of the invention subsequent to such application, and before the expiration of the term of such provisional or other protection.

XI. Where any invention is provisionally protected under this act, or protected by reason of the deposit of such complete specification as aforesaid, the commissioners shall cause such provisional protection or such other protection as aforesaid to be advertised in such manner as they may see fit.

XII. The applicant for letters patent, so soon as he may think fit after the invention shall have been provisionally protected under this act, or where a complete specification has been deposited with his petition and declaration, then, so soon as he may think fit after such deposit, may give notice at the office of the commissioners of his intention of proceeding with his application for letters patent for the said invention, and thereupon the said commissioners shall cause his said application to be advertised in such manner as they may see fit; and any persons having an interest in opposing the grant of letters patent for the said invention shall be at liberty to leave particulars in writing of their objections to the said application at such place and within such time, and subject to such regulations, as the commissioners may direct.

XIII. So soon as the time for the delivery of such objections shall have expired, the provisional specification, or complete specification (as the case may be), and particulars of objection (if any), shall be referred to the law officer to whom the application has been referred.

XIV. It shall be lawful for the law officer to whom any application for such letters patent is referred, if he see fit, by certificate under his hand, to order by or to whom the costs of any hearing or inquiry upon any objection, or otherwise in relation to the grant of such letters patent, or in relation to the provisional (or other) protection acquired by the applicant under this act, shall be paid, and in what manner and by whom such costs are to be ascertained; and if any costs so ordered to be paid be not paid within four days after the amount thereof shall be so ascertained, it shall be lawful for such law officer to make an order for the payment of the same; and every such order may be made a rule of one of her Majesty's superior courts at Westminster or Dublin, and may be recorded in the books of council and session in Scotland to the effect that execution may pass thereupon in common form.

XV. It shall be lawful for such law officer, after such hearing, if any, as he may think fit, to cause a warrant to be made for the sealing of letters patent for the said invention, and such warrant shall be sealed with the seal of the commissioners, and shall set forth the tenor and effect of the letters patent thereby authorised to be granted; and such law officer shall direct the insertion in such letters patent of all such restrictions, conditions, and provisoes as he may deem usual and expedient in such grants, or necessary in pursuance of the provisions of this act; and the said warrant shall be the warrant for the making and sealing of letters patent under this act according to the tenor of the said warrant: provided always that the Lord Chancellor shall and may have and exercise such powers, authority, and discretion in respect to the said warrant, and the letters patent therein directed to be made under this act, as he now has and might now exercise with respect to the warrant for the issue under the Great Seal of letters patent for any invention, and with respect to the making and issuing of such letters patent; and the writ of *scire facias* shall lie for the repeal of any letters patent issued under this act, in the like cases as the same would lie for the repeal of letters patent which may now be issued under the Great Seal.

XVI. Provided also, that nothing herein contained shall extend to abridge or affect the prerogative of the Crown in relation to the granting or withholding the grant of any letters patent; and it shall be lawful for her Majesty, by warrant under her royal sign manual, to direct such law officer to withhold such warrant as aforesaid, or that any letters patent for the issuing whereof he may have issued a warrant as aforesaid shall not issue, or to direct the insertion in any letters patent to be issued in manner herein provided of any restrictions, conditions, or provisoes which her Majesty may think fit in addition to or in substitution for any restrictions, conditions, or provisoes which would otherwise be inserted therein under this act; and it shall also be lawful for her Majesty, by like warrant, to direct any complete specification which may have been filed under the provision hereinbefore contained, and in respect of the invention described in which no letters patent may have been granted, to be cancelled, and thereupon the protection obtained by the filing of such complete specification shall cease.

XVII. All letters patent for inventions granted under the provisions hereinbefore contained shall be made subject to the condition that the same shall be void, and that the powers and privileges thereby granted shall cease and determine, at the expiration of three years and seven years respectively from the date thereof, unless there be paid, before the expiration of the said three and seven years respectively, the sum or sums of money and stamp duties in the schedule to this act annexed; and the payment of the said sums of money and stamp duties respectively shall be endorsed on the warrant for the said letters patent; and such officer of the commissioners as may be appointed for this purpose shall issue under the seal of the commissioners a certificate of such payment, and shall endorse a receipt for the same on any letters patent issued under the authority of the said warrant; and such certificate, duly stamped, shall be evidence of the payment of the several sums respectively.

XVIII. The commissioners, so soon after the sealing of the said warrant as required by the applicant for the letters patent, shall cause to be prepared letters patent for the invention, according to the tenor of the said warrant, and it shall be lawful for the Lord Chancellor to cause such letters patent to be sealed with the Great Seal of the United Kingdom, and such letters patent so sealed shall extend to the whole of the United Kingdom of Great Britain and Ireland, the Channel Islands, and the Isle of Man; and in case such warrant so direct, such letters patent shall be made applicable to her Majesty's colonies and plantations abroad, or such of them as may be mentioned in such warrant; and such letters patent shall be valid and effectual as to the whole of such United Kingdom, and the said islands and isle, and the said colonies or plantations, or such of them as aforesaid, and shall confer the like powers, rights, and privileges as might, in case this act had not been passed, have been conferred by several letters patent of the like purport and effect passed under the Great Seal of the United Kingdom, under the seal appointed to be used instead of the Great Seal of Scotland, and under the Great Seal of Ireland respectively, and made applicable to England, the dominion of Wales, the town of Berwick-upon-Tweed, the Channel Islands, and Isle of Man, and the said colonies and plantations, or such of them as aforesaid, to Scotland, and to Ireland respectively, save as herein otherwise provided: provided always, that nothing in this act contained shall be deemed or taken to give any effect or operation to any letters patent to be granted under the authority of this act in any colony in which such or the like letters patent would be invalid by the law in force in the same colony for the time being: provided always, that a transcript of such letters shall, so soon after the sealing of the same, and in such manner as the commissioners shall direct, be transmitted to the Director of Chancery in Scotland, and be recorded in the records of Chancery in Scotland, upon payment of such fees as the commissioners shall appoint, in the same manner and to the same effect in all respects as letters patent passing under the seal appointed by the Treaty of Union to be used in place of the Great Seal of Scotland have heretofore been recorded, and extracts from the said records shall be furnished to all parties requiring the same, on payment of such fees as the commissioners shall direct, and shall be received in evidence in all courts in Scotland to the like effect as the letters patent themselves.

XIX. Provided always, that no letters patent, save as hereinafter mentioned in the case of letters patent destroyed or lost, shall issue on any warrant granted as aforesaid, unless application be made to seal such letters patent within three months after the date of the said warrant.

XX. Provided also, that no letters patent (save letters patent issued in lieu of others destroyed or lost) shall be issued or be of any force or effect unless the same be granted during the continuance of the provisional protection under this act, or, where a complete specification has been deposited under this act, then unless such letters patent be granted during the continuance of the protection conferred under this act by reason of such deposit, save that where the application to seal such letters patent has been made during the continuance of such provisional or other protection as aforesaid, and the sealing of such letters patent has been delayed by reason of a caveat or an application to the Lord Chancellor against or in relation to the sealing of such letters patent, then such letters patent may be sealed at such time as the Lord Chancellor shall direct.

XXI. Provided also, that where the applicant for such letters patent dies during the continuance of the provisional protection, or the protection by reason of the deposit of a complete specification (as the case may be), such letters patent may be granted to the executors or administrators of such applicant during the continuance of such provisional or other protection, or at any time within three months after the death of such applicant, notwithstanding the expiration of the term of such provisional or other protection, and the letters patent so granted shall be of the like force and effect as if they had been granted to such applicant during the continuance of such provisional or other protection.

XXII. Provided also, that in case any such letters patent shall be destroyed or lost, other letters patent of the like tenor and effect, and sealed and dated as of the same day, may, subject to such regulations as the commissioners may direct, be issued under the authority of the warrant in pursuance of which the original letters patent were issued.

XXIII. It shall be lawful (the act of the eighteenth year of King Henry VI., chapter one, or any other act to the contrary notwithstanding) to cause any letters patent to be issued in pursuance of this act to be sealed and bear date as of the day of the application for the same, and in case of such letters patent for any invention provisionally registered under the "Protection of Inventions Act, 1851," as of the day of such provisional registration, or, where the law officer to whom the application was referred, or the Lord Chancellor, thinks fit and directs, any such letters patent as aforesaid may be sealed and bear date as of the day of the sealing of such letters patent, or of any other day between the day of such application or provisional registration and the day of such sealing.

XXIV. Any letters patent issued under this act, sealed and bearing date as of any day prior to the day of the actual sealing thereof, shall be of the same force and validity as if they had been sealed on the day as of which the same are expressed to be sealed and bear date: provided always, that save where such letters patent are granted for any invention, in respect whereof a complete specification has been deposited upon the application for the same under this act, no proceeding at law or in equity shall be had upon such letters patent in respect of any infringement committed before the same were actually granted.

XXV. Where, upon any application made after the passing of this act, letters patent are granted in the United Kingdom for or in respect of any invention first invented in any foreign country, or by the subject of any foreign power or state, and a patent or like privilege for the monopoly or exclusive use or exercise of such invention in any foreign country is there obtained before the grant of such letters patent in the United Kingdom, all rights and privileges under such letters patent shall (notwithstanding any term in such letters patent limited) cease and be void immediately upon the expiration or other determination of the term during which the patent or like privilege obtained in such foreign country shall continue in force, or where more than one such patent or like privilege is obtained abroad, immediately upon the expiration or determination of the term which shall first expire or be determined of such several patents or like privileges: provided always, that no letters patent for or in respect of any invention for which any such patent or like privilege as aforesaid shall have been obtained in any foreign country, and which shall be granted in the said United Kingdom after the expiration of the term for which such patent or privilege was granted or was in force, shall be of any validity.

XXVI. No letters patent for any invention (granted after the passing of this act) shall extend to prevent the use of such invention in any foreign ship or vessel, or for the navigation of any foreign ship or vessel, which may be in any port of her Majesty's dominions, or in any of the waters within the jurisdiction of any of her Majesty's courts, where such invention is not so used for the manufacture of any goods or commodities to be vended within or exported from her Majesty's dominions: provided always, that this enactment shall not extend to the ships or vessels of any foreign state of which the laws authorise subjects of such foreign state, having patents or like privileges for the exclusive use or exercise of inventions within its territories, to prevent or interfere with the use of such inventions in British ships or vessels, or in or about the navigation of British ships or vessels, while in the ports of such foreign state, or in the waters within the jurisdiction of its courts, where such inventions are not so used for the manufacture of goods or commodities to be vended within or exported from the territories of such foreign state.

XXVII. All letters patent to be granted under this act (save only letters patent granted after the filing of a complete specification) shall require the specification thereunder to be filed in the High Court of Chancery, instead of requiring the same to be enrolled, and no enrolment shall be requisite.

XXVIII. Every specification to be filed in pursuance of the condition of any letters patent shall be filed in such office of the Court of Chancery as the Lord Chancellor shall from time to time appoint, and every provisional specification and complete specification left or filed at the office of the commissioners on the application for any letters patent, shall forthwith after the grant of the letters patent, or, if no letters patent be granted, then immediately on the expiration of six months from the time of such application, be transferred to and kept in the said office appointed for filing specifications in Chancery; and in case reference is made to drawings in any specification deposited or filed under this act, an extra copy of such drawings shall be left with such specification.

XXIX. The commissioners shall cause true copies of all specifications (other than provisional specifications), disclaimers, and memoranda of alterations filed under or in pursuance of this act, and of all provisional specifications after the term of the provisional protection of the invention has expired, to be open to the inspection of the public at the office of the commissioners, and at an office in Edinburgh and Dublin respectively, at all reasonable times, subject to such regulations as the commissioners may direct; and the commissioners shall cause a transcript of the said letters patent to be transmitted for enrolment in the Court of Chancery, Dublin, and shall cause the same to be enrolled therein, and the transcript or exemplification thenceforward shall have the like effect to all intents and purposes as if the original letters patent had been enrolled in the Court of Chancery in Dublin, and all parties shall have all their remedies by *scire facias* or otherwise, as if the letters patent had been granted to extend to Ireland only.

XXX. The commissioners shall cause to be printed, published, and sold at such prices and in such manner as they may think fit, all specifications, disclaimers, and memoranda of alterations deposited or filed under this act, and such specifications (not being provisional specifications), disclaimers, and memoranda respectively shall be so printed and published as soon as conveniently may be after the filing thereof respectively, and all such provisional specifications shall be so printed and published as soon as conveniently may be after the expiration of the provisional protection obtained in respect thereof; and it shall be lawful for the commissioners to present copies of all such publications to such public libraries and museums as they may think fit, and to allow the person depositing or filing any such specification, disclaimer, or memorandum of alteration to have such number, not exceeding twenty-five, of the copies thereof so printed and published, without any payment for the same, as they may think fit.

XXXI. It shall be lawful for the Lord Chancellor and the Master of the Rolls to direct the enrolment of specifications, disclaimers, and memoranda of alterations heretofore or hereafter enrolled or deposited at the Rolls Chapel-office, or at the Petty Bag-office, or at the Enrolment-office of the Court of Chancery, or in the custody of the Master

of the Rolls as keeper of the public records, to be transferred to and kept in the office appointed for filing specifications in Chancery under this act.

XXXII. The commissioners shall cause indexes to all specifications, disclaimers, and memoranda of alterations heretofore or to be hereafter enrolled or deposited as last aforesaid to be prepared in such form as they may think fit, and such indexes shall be open to the inspection of the public at such place or places as the commissioners shall appoint, and subject to the regulations to be made by the commissioners, and the commissioners may cause all or any of such indexes, specifications, disclaimers, and memoranda of alterations to be printed, published, and sold in such manner and at such prices as the commissioners may think fit.

XXXIII. Copies, printed by the printers to the Queen's Majesty, of specifications, disclaimers, and memoranda of alterations shall be admissible in evidence, and deemed and taken to be *primâ facie* evidence of the existence and contents of the documents to which they purport to relate in all courts and in all proceedings relating to letters patent.

XXXIV. There shall be kept at the office appointed for filing specifications in Chancery under this act a book or books, to be called "The Register of Patents," wherein shall be entered and recorded in chronological order all letters patent granted under this act, the deposit or filing of specifications, disclaimers, and memoranda of alterations filed in respect of such letters patent, all amendments in such letters patent and specifications, all confirmations and extensions of such letters patent, the expiry, vacating, or cancelling such letters patent, with the dates thereof respectively, and all other matters and things affecting the validity of such letters patent as the commissioners may direct, and such register, or a copy thereof, shall be open at all convenient times to the inspection of the public, subject to such regulations as the commissioners may make.

XXXV. There shall be kept at the office appointed for filing specifications in Chancery under this act a book or books, entitled "The Register of Proprietors," wherein shall be entered, in such manner as the commissioners shall direct, the assignment of any letters patent, or of any share or interest therein, any licence under letters patent, and the district to which such licence relates, with the name or names of any person having any share or interest in such letters patent or licence, the date of his or their acquiring such letters patent, share, and interest, and any other matter or thing relating to or affecting the proprietorship in such letters patent or licence; and a copy of any entry in such book, certified under such seal as may have been appointed, or as may be directed by the Lord Chancellor to be used in the said office, shall be given to any person requiring the same, on payment of the fees hereinafter provided; and such copies so certified shall be recieved in evidence in all courts and in all proceedings, and shall be *primâ facie* proof of the assignment of such letters patent, or share or interest therein, or of the licence or proprietorship, as therein expressed: provided always, that until such entry shall have been made the grantee or grantees of the letters patent shall be deemed and taken to be the sole and exclusive proprietor or proprietors of such letters patent, and of all the licences and privileges thereby given and granted; that certified duplicates of all entries made in the said register of proprietors shall forthwith be transmitted to the office of the commissioners in Edinburgh and Dublin, where the same shall also be open to the inspection of the public; and any writ of *scire facias* to repeal such letters patent may be issued to the sheriff of the county or counties in which the grantee or grantees resided at the time when the said letters patent were granted; and in case such grantee or grantees do not reside in the United Kingdom, it shall be sufficient to file such writ in the Petty Bag-office, and serve notice thereof in writing at the last known residence or place of business of such grantee or grantees; and such register, or a copy, shall be open to the inspection of the public at the office of the commissioners, subject to such regulations as the commissioners may make: provided always, that in any proceeding in Scotland to repeal any letters patent, service of all writs and summonses shall be made according to the existing forms and practice: provided also, that the grantee or grantees of letters patent to be hereafter granted may assign the letters patent for England, Scotland, or Ireland respectively as effectually as if the letters patent had been originally granted to extend to England, or Scotland, or Ireland only, and the assignee or assignees shall have the same rights of action and remedies, and shall be subject to the like actions and suits as he or they should and would have had and been subject to upon the assignment of letters patent granted to England, Ireland, or Scotland before the passing of this act.

XXXVI. Notwithstanding any proviso that may exist in former letters patent, it shall be lawful for a larger number than twelve persons hereafter to have a legal and beneficial interest in such letters patent.

XXXVII. If any person shall wilfully make, or cause to be made, any false entry in the said register of proprietors, or shall wilfully make or forge, or cause to be made or forged, any writing falsely purporting to be a copy of any entry in the said book, or shall produce or tender, or cause to be produced or tendered, in evidence any such writing, knowing the same to be false or forged, he shall be guilty of a misdemeanour, and shall be punished by fine and imprisonment accordingly.

XXXVIII. If any person shall deem himself aggrieved by any entry made under colour of this act in the said register of proprietors, it shall be lawful for such person to apply, by motion, to the Master of the Rolls, or to any of the courts of common law at Westminster in term time, or by summons to a judge of any of the said courts in vacation, for an order that such entry may be expunged, vacated, or varied; and upon any such application the Master of the Rolls, or such court or judge respectively, may make such order for expunging, vacating, or varying such entry, and as to the costs of such application, as to the said Master of the Rolls, or to such court or judge may seem fit; and the officer having the care and custody of such register, on the production to him of any such order for expunging, vacating, or varying any such entry, shall expunge, vacate, or vary the same, according to the requisitions of such order.

XXXIX. All the provisions of the acts of the session holden in the fifth and six years of King William IV., chapter eighty-three, and of the session holden in the seventh and eighth years of her Majesty, chapter sixty-nine, respectively, relating to disclaimers and memoranda of alterations in letters patent and specifications, except as hereinafter provided, shall be applicable and apply to any letters patent granted, and to any specification filed under the provisions of this act: provided always, that all applications for leave to enter a disclaimer or memorandum of alteration shall be made, and all caveats relating thereto shall be lodged at the office of the commissioners, and shall be referred to the respective law officers in the said first-recited act mentioned: provided also, that every such disclaimer or memorandum of alteration shall be filed in the office appointed for filing specifications in Chancery under this act, with the specification to which the same relates, in lieu of being entered or filed, and enrolled as required by the said first-recited act, or by the act of the session holden in the twelfth and thirteenth years of her Majesty, chapter one hundred and nine, and the said act shall be construed accordingly: provided also, that such filing of any disclaimer or memorandum of alteration, in pursuance of the leave of the law officer in the first-recited act mentioned, certified as therein mentioned, shall, except in cases of fraud, be conclusive as to the right of the party to enter such disclaimer or memorandum of alteration under the said acts and this act; and no objection shall be allowed to be made in any proceeding upon or touching such letters patent, specification, disclaimer, or memorandum of alteration, on the ground that the party entering such disclaimer or memorandum of alteration had not sufficient authority in that behalf: provided also, that no action shall be brought upon any letters patent in which or on the specification of which any disclaimer or memorandum of alteration shall have been filed in respect of any infringement committed prior to the filing of such disclaimer or memorandum of alteration, unless the law officer shall certify in his fiat that any such action may be brought, notwithstanding the entry or filing of such disclaimer or memorandum of alteration.

XL. All the provisions of the said act of the fifth and sixth years of King William IV., for the confirmation of any letters patent, and the grant of new letters patent, and all the provisions of the said act, and of the acts of the session holden in the second and third years of her Majesty, chapter sixty-seven, and of the session holden in the seventh and eighth years of her Majesty, chapter sixty-nine, respectively, relating to the prolongation of the term of letters patent, and to the grant of new letters patent for a further term, shall extend and apply to any letters patent granted under the provisions of this act, and it shall be lawful for her Majesty to grant any new letters patent, as in the said acts mentioned; and in the granting of any such new letters patent her Majesty's order in Council shall be a sufficient warrant and authority for the sealing of any new letters patent, and for the insertion in such new letters patent of any restrictions, conditions, and provisions in the said order mentioned; and the Lord Chancellor, on the receipt of the said order in Council, shall cause letters patent, according to the tenor and effect of such order, to be made and sealed in the manner herein directed for letters patent issued under the warrant of the law officer: provided always, that such new letters patent shall extend to and be available in and for such places as the original letters patent extended to and were available in: provided also, that such new letters patent shall be sealed and bear date as of the day after the expiration of the term of the original letters patent which may first expire.

XLI. In any action in any of her Majesty's superior courts of record at Westminster or in Dublin for the infringement of letters patent, the plaintiff shall deliver with his declaration particulars of the breaches complained of in the said action, and the defendant, on pleading thereto, shall deliver with his pleas, and the prosecutor in any proceedings by *scire facias* to repeal letters patent shall deliver with his declaration, particulars of any objections on which he means to rely at the trial in support of the pleas in the said action or of the suggestion of the said declaration in the proceedings by *scire facias* respectively; and at the trial of such action or proceeding by *scire facias* no evidence shall be allowed to be given in support of any alleged infringement or of any objection impeaching the validity of such letters patent which shall not be contained in the particulars delivered as aforesaid: provided always, that the place or places at or in which and in what manner the invention is alleged to have been used or published prior to the date of the letters patent shall be stated in such particulars: provided also, that it shall and may be lawful for any judge at chambers to allow such plaintiff or defendant or prosecutor respectively to amend the particulars delivered as aforesaid, upon such terms as to such judge shall seem fit: provided also, that at the trial of any proceeding by *scire facias* to repeal letters patent the defendant shall be entitled to begin and to give evidence in support of such letters patent, and in case evidence shall be adduced on the part of the prosecutor impeaching the validity of such letters patent, the defendant shall be entitled to the reply.

XLII. In any action in any of her Majesty's superior courts of record at Westminster and in Dublin for the infringement of letters patent, it shall be lawful for the court in which such action is pending, if the court be then sitting, or if the court be not sitting, then for a judge of such court, on the application of the plaintiff or defendant respectively, to make such order for an injunction, inspection, or account, and to give such direction respecting such action, injunction, inspection, and account, and the proceedings therein respectively, as to such court or judge may seem fit.

XLIII. In taxing the costs in any action in any of her Majesty's superior courts at Westminster or in Dublin, commenced after the passing of this act for infringing letters patent, regard shall be had to

the particulars delivered in such action, and the plaintiff and defendant respectively shall not be allowed any costs in respect of any particular, unless certified by the judge before whom the trial was had to have been proved by such plaintiff or defendant respectively, without regard to the general costs of the cause; and it shall be lawful for the judge before whom any such action shall be tried to certify on the record that the validity of the letters patent in the declaration mentioned came in question; and the record, with such certificate, being given in evidence in any suit or action for infringing the said letters patent, or in any proceeding by *scire facias* to repeal the letters patent, shall entitle the plaintiff in any such suit or action, or the defendant in such proceeding by *scire facias*, on obtaining a decree, decretal order, or final judgment, to his full costs, charges, and expenses, taxed as between attorney and client, unless the judge making such decree or order, or the judge trying such action or proceeding, shall certify that the plaintiff or defendant respectively ought not to have such full costs: provided always, that nothing herein contained shall affect the jurisdiction and forms of process of the courts in Scotland in any action for the infringement of letters patent, or in any action or proceeding respecting letters patent hitherto competent to the said courts: provided also, that when any proceedings shall require to be taken in Scotland to repeal any letters patent, such proceedings shall be taken in the form of an action of reduction at the instance of her Majesty's Advocate, or at the instance of any other party having interest with concurrence of her Majesty's Advocate, which concurrence her Majesty's Advocate is authorised and empowered to give upon just cause shown only.

XLIV. There shall be paid in respect of letters patent applied for or issued as herein mentioned, the filing of specifications and disclaimers, certificates, entries, and searches, and other matters and things mentioned in the schedule to this act, such fees as are mentioned in the said schedule; and there shall be paid unto and for the use of her Majesty, her heirs and successors, for or in respect of the warrants and certificates mentioned in the said schedule, or the vellum, parchment, or paper on which the same respectively are written, the stamp duties mentioned in the said schedule; and no other stamp duties shall be levied, or fees, except as hereinafter mentioned, taken in respect to such letters patent and specifications, and the matters and things in such schedule mentioned.

XLV. The stamp duties hereby granted shall be under the care and management of the Commissioners of Inland Revenue; and the several rules, regulations, provisions, penalties, clauses, and matters contained in any act now or hereafter to be in force with reference to stamp duties shall be applicable thereto.

XLVI. The fees to be paid as aforesaid shall from time to time be paid into the receipt of the Exchequer, and be carried to and made part of the Consolidated Fund of the United Kingdom.

XLVII. Provided always, that nothing herein contained shall prevent the payment as heretofore to the law officers in cases of opposition to the granting of letters patent, and in cases of disclaimers and memoranda of alterations, of such fees as may be appointed by the Lord Chancellor and Master of the Rolls as the fee to be paid on the hearing of such oppositions, and in the case of disclaimers and memoranda of alterations respectively, or of such reasonable sums for office or other copies of documents in the office of the commissioners, as the commissioners may from time to time appoint to be paid for such copies, and the Lord Chancellor and Master of the Rolls, and the commissioners, are hereby respectively authorised and empowered to appoint the fees to be so paid in respect of such oppositions, disclaimers, and memorenda of alterations respectively, and for such office or other copies.

XLVIII. It shall be lawful for the Commissioners of her Majesty's Treasury from time to time to allow such fees to the law officers and their clerks (for duties under this act in respect of which fees may not be payable to them under the provisions lastly hereinbefore contained) as the Lord Chancellor and Master of the Rolls may from time to time appoint, and to allow such salaries and payments to any clerks and officers to be appointed under this act, and such additional salaries and payments to any other clerks and officers in respect of any additional duties imposed on them by this act, as the said Commissioners of the Treasury may think fit.

XLIX. It shall be lawful for the Commissioners of her Majesty's Treasury to allow from time to time the necessary sums for providing offices under this act, and for the fees, salaries, and payments allowed by them as aforesaid, and for defraying the current and incidental expenses of such office or offices; and the sums to be so allowed shall be paid out of such moneys as may be provided by Parliament for that purpose.

L. And whereas divers persons by virtue of their offices or appointments are entitled to fees or charges payable in respect of letters patent as heretofore granted within the United Kingdom of Great Britain and Ireland, or have and derive in respect of such letters patent, or the procedure for the granting thereof, fees or other emoluments or advantages:—

It shall be lawful for the said Commissioners of the Treasury to grant to any such persons who may sustain any loss of fees, emoluments, or advantages by reason of the passing of this act, such compensation as, having regard to the tenure and nature of their respective offices and appointments, such commissioners deem just and proper to be awarded; and all such compensations shall be paid out of such moneys as may be provided by Parliament for that purpose: provided always, that in case any person to whom any yearly sum by way of compensation shall be awarded and paid shall, after the passing of this act, be appointed to any office or place of emolument under the provisions of this act, or in the public service, then and in every such case the amount of such yearly sum shall in every year be diminished by so much as the emoluments of such person for such year from such office or place shall amount to, and provision in that behalf shall be made in the award to him of such yearly sum.

LI. An account of all salaries, fees, allowances, sums, and compensations to be appointed, allowed, or granted under this act shall, within fourteen days next, after the same shall be so appointed, allowed, or granted respectively, be laid before both Houses of Parliament, if Parliament be then sitting, or if Parliament be not then sitting, then within fourteen days after the next meeting of Parliament.

LII. Letters patent may be granted in respect of applications made before the passing of this act, in like manner and subject to the same provisions as if this act had not been passed.

LIII. Where letters patent for England, or Scotland, or Ireland have been granted before the passing of this act, or are in respect of any application made before the passing of this act hereafter granted for any invention, letters patent for England, or Scotland, or Ireland may be granted for such invention in like manner as if this act had not been passed: provided always, that in lieu of all the fees or payments and stamp duties now payable in respect of such letters patent, or in or about obtaining a grant thereof, there shall be paid in respect of such letters patent for England, or Scotland, or Ireland, on the sealing of such respective letters patent, a sum equal to one-third part of the fees and stamp duties which would be payable according to the schedule to this act in respect of letters patent issued for the United Kingdom under this act, on or previously to the sealing of such letters patent; and at or before the expiration of the third year and the seventh year respectively of the term granted by such letters patent for England, or Scotland, or Ireland, sums equal to one-third part of the fees and stamp duties payable at the expiration of the third year and the seventh year respectively of the term granted by letters patent issued for the United Kingdom under this act; and the condition of such letters patent for England, or Scotland, or Ireland, shall be varied accordingly; and such fees shall be paid to such persons as the Commissioners of her Majesty's Treasury shall appoint, and shall be carried to and form part of the said Consolidated Fund.

LIV. The several forms in the schedule to this act may be used for and in respect of the several matters therein mentioned, and the commissioners may, where they think fit, vary such forms as occasion may require, and cause to be printed and circulated such other forms as they may think fit to be used for the purposes of this act.

LV. In the construction of this act the following expressions shall have the meanings hereby assigned to them, unless such meanings be repugnant to or inconsistent with the context (that is to say):—

The expression "Lord Chancellor" shall mean the Lord Chancellor, or Lord Keeper of the Great Seal, or Lords Commissioners of the Great Seal.

The expression "the commissioners" shall mean the commissioners for the time being acting in execution of this act.

The expression "law officer" shall mean her Majesty's Attorney-General or Solicitor-General for the time being for England, or the Lord Advocate or her Majesty's Solicitor-General for the time being for Scotland, or her Majesty's Attorney-General or Solicitor-General for the time being for Ireland.

The expression "invention" shall mean any manner of new manufacture the subject of letters patent and grant of privilege within the meaning of the act of the twenty-first year of the reign of King James I., chapter three.

The expression "petition," "declaration," "provisional specification," "warrant," and "letters patent" respectively, shall mean instruments in the form and to the effect in the schedule hereto annexed, subject to such alterations as may from time to time be made therein under the powers and provisions of this act.

LVI. In citing this act in other acts of Parliament, instruments, and proceedings, it shall be sufficient to use the expression "The Patent Law Amendment Act, 1852."

LVII. This act shall commence and take effect from Oct. 1, 1852.

THE SCHEDULE TO WHICH THIS ACT REFERS.

Fees to be paid.

On leaving petition for grant of letters patent	£5	0	0
On notice of intention to proceed with the application	5	0	0
On sealing of letters patent	5	0	0
On filing specification	5	0	0
At or before the expiration of the third year	40	0	0
At or before the expiration of the seventh year	80	0	0
On leaving notice of objections	2	0	0
Every search and inspection	0	1	0
Entry of assignment or licence	0	5	0
Certificate of assignment or licence	0	5	0
Filing application for disclaimer	5	0	0
Caveat against disclaimer	2	0	0

Stamp Duties to be paid.

On warrant of law officer for letters patent	5	0	0
On certificate of payment of the fee payable at or before the expiration of the third year	10	0	0
On certificate of payment of the fee payable at or before the expiration of the seventh year	20	0	0

AUTHENTIC STATISTICS OF THE LATE "GREAT EXHIBITION."

The "First Report of the Commissioners for the Exhibition of 1851" has been published, and the *Athenæum* contains an interesting notice of it, from which we take the following details. The report shows that twenty-six deputy commissioners were employed in organising the country. There were appointed no less than 697 local committees in the towns and districts of Great Britain and Ireland. The number of subscribers, except in a few cases, cannot be ascertained. Of 8111 who are known, the average subscription was about £1. 15s. 6d. a head. Nearly double the entire amount of space was applied for in the first instance. Of the 6924 persons to whom space was originally allotted, only 63 failed to send in articles for exhibition. With regard to the subscriptions there are some curious facts to note. The total amount reported to the commission was £79,224. 13s. 4d.;

but the sums actually paid into their bankers' hands was only £67,896. 12s. 9d. Thus, more than £11,200, or nearly 14 per cent., never found its way to them—being either unpaid by the original subscribers, or retained by the local committees to cover the expenses of management. For example, Marylebone published a list of subscriptions amounting to £1257. 10s. 4d.; which gave it the seventh place in the general list—that is, after London, Westminster, Manchester, Glasgow, Leeds, and Bradford. But we find by the report now printed that this position was not secured by performance; for the amount actually forthcoming was only £547. 13s. 3d.—being less than was paid in by such fourth-rate provincial towns as Blackburn and Bolton. It seems to have cost the people of Ashborne £4. 2s. to send the commission £1. 11s. Rochester sends up £1. 0s. 8d., and retains £7. 11s. 4d. Great Marlow sends £8, and retains £7. Ripon sends £15, and keeps back £10. But the case is equally flagrant with some towns of greater importance. Truro subscribed £110. 10s., but sent no more than £4. 8s. 8d. to the commissioners, while they kept the other £106. 1s. 4d. in their own pockets. In like manner, Dublin is set down in the printed lists at £406. 4s.; but the bankers' book shows that of this gross total it has paid up only a single £5 note—all the rest being used for "expenses." All the Irish towns exhibit large discrepancies. Even Belfast, the best of them, charges £281 for sending over £300. In some English towns of reputation there are differences which it seems difficult to account for on any satisfactory principle. It cost Birmingham £396 to collect and transmit to London £500, while Bath forwarded £200 at an expense of £3. 1s. Some places in the list retained the whole amount of their subscriptions. In this class we notice Bakewell, Halsted, East Retford, St. Helen's, Wexford, and Wallingford. There are several towns in which committees were formed which, it now appears, have made no subscription at all. Among this class we find Richmond, Burnley, Carnarvon, Lanark, Luton, &c. Against these, however, there is a pleasant set-off in the fact that numerous places forwarded every shilling subscribed to the bank, making no drawbacks whatever for local expenses. Nearly half the entire amount raised was given in London and its outlying districts. Of the remainder it now appears that more than a moiety was subscribed in a narrow strip of country lying between the mouths of the Humber and the Mersey. Thus, from a number of towns, containing perhaps less than a twelfth of the populatien of these islands, came more than two-thirds of the money for the Exhibition. Passing from these details, we notice one or two other points of interest. The total number of season tickets sold, it appears, amounted to 25,065; of which number less than a moiety was held by ladies—the proportions being, ladies' tickets, 12,111; gentlemen's, 13,494. While referring to the proportion of the sexes, we may as well add in this place, from a note to the commissioners' report, that 270 gallons of *eau de Cologne*, *aqua d'ore*, and other scents were distributed—duty free—in the building; that more than 500 lb. weight of snuff and 250 lb. weight of cigars were "tasted" away in the Portuguese, Turkish, and American departments; and that the children were feasted on chocolate drops in the Saxony, French, and Turkish divisions to a large extent. The number of visits paid to the Crystal Palace up to the 11th of October was 6,063,986. It is, of course, impossible to ascertain how may separate visitors these six millions of visits represent; but it is shown to be probable that about two millions of persons entered the Crystal Palace. It appears, also, that the average number of daily visitors was 42,381, the greatest number in one day 109,915, and the greatest number at any one time 93,224. A summary of the lists furnished by all the captains of steamers plying between English and continental ports to the Home-office, shows, that from April the 1st to September the 30th, the arrivals of aliens from all parts of the world—including Americans, the number of these being supplied by the United States' legation—amounted to only 58,427. From these should be deducted those who came to England not to see the Exhibition, but for ordinary reasons; and taking this fraction at the rate of the previous year, 15,514, there will be left 42,913 as the number of those who crossed the seas for the purpose of inspecting the contents of the Crystal Palace. On examining the separate returns, we observe that the largest number of visitors compared with population came to us from Holland; the next from Belgium; then follow in order France, Germany, Switzerland, the United States, and so on down to China, from which the total arrivals were eight. Of positive numbers, however, France sent the largest; the states already named being represented in London respectively thus:—France by 27,200; Germany by 10,400; United States by 5000; Belgium by 3700; Holland by 2900 persons. It is not easy to estimate in any fashion not liable to some errors the number of provincial visitors, or the permanent addition to the usual population of the metropolis. But a rough calculation may be made, such as will suffice for curiosity, if not for science. The arrivals in London can be ascertained with considerable accuracy—as very few come in otherwise than by steamboat and railway, the numbers of which are at all times carefully ascertained—how many of these are Londoners returning from the country is unknown. However, the total of arrivals during the six months of the Exhibition was 4,237,240 against 2,791,753 in the same period of the previous year. There is, however, a natural increase in railway traffic every year—an increase not depending on causes so particular and temporary as the Exhibition. Taking this natural increase at 14·37 per cent., and deducting this rate from the London arrivals, the excess of 1851 justly attributable to the Exhibition will appear to be 1,035,100 persons. On the supposition that London itself furnished not more than a million of the visitors, it follows that the immigrant provincial population went on an average each person three times to the Crystal Palace. The total receipts amounted to £506,100. 6s. 11d., and the expenditure to £292,794. 11s. 3d., leaving a balance of £213,305. 15s. 3d.; but this balance has been subsequently reduced by various payments, and the commissioners now estimate the *bonâ fide* surplus available for ulterior disposal at, in round numbers, £150,000. In June, last year, estimates of the value of the contents of the Crystal Palace varied from twelve to fifty millions. An appendix (No. 36) to the commissioners' report disperses this gorgeous dream somewhat rudely; for we there find that, taking each individual's own estimate of the value of his work or possession, the whole falls short of two millions—the precise figures being £1,781,929. 11s. 4d. From this estimate the fabulous Koh-i-noor is excluded, but no other article in the Exhibition. The appendix gives some curious particulars respecting the waiting-rooms and washing places. The total amount of the fittings-up in this department was about £1600. The current receipts for the waiting-rooms for the whole period were £2441, the expenditure £671, leaving a balance from this source of £1769. The receipts of the washing places were £443, the expenditure £272, and the consequent balance £171. The largest receipts from the waiting-rooms on any one given day was on the 8th of October, and amounted to £32. 16s. 3d., on which day 11,171 persons made use of them. It appears, also, that during the time of the Exhibition, 827,820 persons paid for the use of these conveniences, or 14 per cent. of the visitors.

THE COAL DUTIES LEVIED IN THE METROPOLIS BY THE CORPORATION OF THE CITY OF LONDON.

MARYLEBONE VESRYT.

At a numerously attended meeting of the Marylebone Vestry, held on July 3, Alfred Daniell, Esq., in the chair,

Mr. W. E. Greenwell, the vestry clerk, brought up and read the following important report from a committee appointed for the purpose of considering what steps it may be necessary to take to relieve Marylebone and the rest of the metropolis from the coal duty and cart tax, imposed upon them by the corporation of the city of London.

"*St. Marylebone, June 5*, 1852.

"At the committee appointed to consider and report on the coal duty, and the tax upon carts entering and leaving the city of London,

"Present, Mr. Hodges in the chair, Mr. George, Mr. How, Mr. Braess.

"Your committee having taken the matter referred to them into consideration, and having had before them the report of the coal duties, of which Mr. Hume was chairman, and other parliamentry documents, specially report as follows:—

"That upon investigation of the various returns relating to the coal duty, it is found that the total produce of the tax of 1s. 1d. per ton for the nine years ending 1844 amounted to £1,288,346. 3s. 3d., being an average of £143,149. 11s. 5d. per annum.

"Your committee have been unable to ascertain the amount raised by the whole duty up to the present time, the latter returns only giving the amount of the duty of 9d. per ton; from this the duty of 8d. has produced for the three years ending January 5, 1850, the sum of £337,887. 17s., or an average of £112,629. 5s. 8d. per annum. The duty of a 1d. per ton produced for the year ending December 31, 1850, the sum of £15,230. 0s. 8½d., and allowing the sum of £519. 17s. 1d. for drawbacks on coals exported, the net sum of £14,710. 3s. 7½d.

"Your committee have ascertained that the whole of the charges, with interest on the above eightpenny duty, will be satisfied by the 5th of July, 1859, but the act of Parliament enables the City authorities to levy the duty to the 5th of July, 1862; and already some schemes are afloat to absorb prospectively a portion of the revenue to be derived therefrom, among which is a proposition to make a new street from St. Martin's-lane to Long-acre. Your committee cannot recognise the justice of taxing two millions of people for the purpose of increasing the value of landed property in particular districts, a principle which, if equitable, should be extended to the relief of all the landed proprietors of the metropolis, and the tax itself, instead of being levied and expended by a body elected by a small portion, should be under the control of all who contribute to the amount.

"On the general question of the propriety of the coal-tax, your committee have to remark, that the Legislature having, mainly on sanitary grounds, abolished the window duty, it appears to them unreasonable and inconsistent to continue restrictions on artificial light and heat in the comparatively humid and gloomy atmosphere of this country, beyond the time absolutely necessary to liquidate prior engagements.

"With respect to the tolls on carts, &c., entering and leaving the City of London and conveying goods, it appears by a return furnished to the House of Commons, that the income arising from that source has been farmed to contractors, who have paid to the corporation the sums following:—

"For the year ending 31st of December,	1849	£5610
"	1850	5710
"	1851	5810

"Your committee consider that the above toll is unjust and vexatious to the inhabitants of the metropolis generally, and injurious to the citizens of London, as indeed is acknowledged by the corporation, who have proposed in the preamble of a bill ordered to be brought in by Sir James Duke and Mr. Masterman (15th Vic., sess. 1852), to abolish 'the said tolls, and to give up the profit and advantages thereof.' Unfortunately, the bill itself contains no provision to carry out so laudable and proper a determination.

"Your committee having carefully considered these matters, recommend as follows:—

"1. That the vestry petition both Houses of Parliament to pass a measure which shall cause the duty of 8d. per ton on coals absolutely to cease and determine so soon as the now existing liabilites shall be paid and liquidated, and not to sanction any measure which shall have the effect of continuing the tax on this necessary article beyond that period.

"2. That the vestry petition both Houes of Parliament, that the toll on carts and other vehicles conveying goods into and from the city of London be discontinued.

"(Signed) E. Hodges. W. R. Rowe.
Clement George. George W. Braess."

Mr. Hodges, as chairman of the committee, moved the adoption of the report.

Mr. Rowe seconded the resolution, and went into the statistics as to the origin of the taxes.

Mr. Clement George said, as one of the committee, he gave his support to the resolution. He could remember, in his younger days, in the City, that the 5d. duty on coals was one of the leading topics

for popularity on St. Thomas's Day to get into the Common Council. It was raised to 1s. 1d. for the purpose of defraying the expense of the London Bridge approaches, and that would be paid off in 1862; but that was no reason that the act which expired in 1859 should be continued longer than that period. It was the duty, therefore, of not only Marylebone, but all metropolitan parishes, to aid in getting rid of so unjust and abominable an impost. They had no right to be taxed for this article of consumption for the City of London expressly. (Hear, hear.) It was a very heavy tax, and the effect of it might be ascertained when he stated the fact, that the parish of Marylebone alone was taxed by the Corporation of London no less a sum than £20,000 per annum for the coals they consumed. (Hear, hear.) He hoped, therefore, that the vestry would agree with him in thinking that this was really a proper subject for them to entertain. (Hear, hear.) He could not see why the corrupt Corporation of London should have the power of keeping to themselves this immense source of revenue and profit; and it was time that they should agitate upon the subject, and let the public know the enormous extent to which the metropolis was robbed by the corporation of London. (Hear, hear.) And what for? (Hear.) Why, to spend chiefly in guttling. (Laughter.) The whole of the committees of the corporation of London were one scene of gormandising. (Laughter, and Hear, hear.) If there was one thing more than another of which he (Mr. C. George) had to complain of Lord John Russell and the late Liberal Government, it was that when the bill was brought in for the improvement of the municipal corporations of the kingdom, they had not sufficient courage to attack the foul corruptions in the corporation of the City of London, which was, without exception, the most vile and abominably corrupt corporation in the kingdom. (Hear, hear.)

Mr. Peter Northall Laurie had listened with some attention to the discussion, and he should not have taken any part in it, had it not been for the language which had been indulged in by their friend, Mr. George, against the Corporation of London—language, so unusual from such a quarter, would be calculated to give a notion that their friend had on some occasion been a defeated candidate for civic honours. He had found fault with his friend, Lord John Russell, (laughter)—for not reforming that "vile and abominably corrupt" corporation. (Hear, hear.) Now, he (Mr. Laurie) begged to tell the vestry, whatever Lord John Russell might have done for other corporations by his Municipal Corporations Bill, he had done nothing by that measure at all approaching the liberality exercised in the city with regard to the Corporation of the City of London.

Mr. Clement George begged to explain to the worthy city pleader that he never was a candidate in his life.

After some further discussion the report was adopted unanimously.

Manufacture of Prussian Blue.—Much attention has of late been drawn to the cyanogen compounds evolved during the distillation of coal in the manufacture of gas; and it must be confessed that a wide field for improvement is opened in this direction. The quantity of cyanogen given off during the decomposition of one ton of common Newcastle coal is sufficient to produce about seven pounds of Prussian blue, which, at the existing market price, would greatly exceed the total value of the coal. The cyanogen is most probably evolved in the form of cyanide of ammonium, and therefore requires protoxide of iron for the purpose of rendering it a fixed and permanent salt. Hence, if either the protoxide or peroxide of iron be placed so that the gaseous constituents of the coal are made to pass through or over these oxides, a quantity of Prussian blue, and prussiate of ammonia, are generated; and this process may be repeated until almost the whole of the oxide of iron has been converted into ferrocyanic acid and Prussian blue. We have said that the peroxide of iron will answer this end as well as the protoxide; but, in reality, it is still the protoxide which acts, for the impure coal gas always contains sulphuretted hydrogen; and this, as is well known, has the property of reducing the peroxide of iron to the protoxide; consequently, both are equally efficacious in the production of ferrocyanic acid. When impure coal gas, therefore, has been passed, for some time, over either of the oxides of iron, a substance results from which prussiate of potash may be obtained, at a rate which must, one day, lead to the total suppression of the present mode of making that article. Let us suppose, for example, that a few pounds of oxide of iron have been mingled with sawdust, and subjected to the action of the impure gas arising from the distillation of fifty tons of coal: then sufficient cyanogen must have combined with the iron to generate thirty-five pounds of Prussian blue, and this, too, without the least expense. Now, these thirty-five pounds of Prussian blue, when treated with caustic lime and sulphate of potash, would afford oxide of iron, sulphate of lime, and prussiate of potash, by double decomposition, the latter of which would require only to be crystallised from the fluid in which it was dissolved; whilst the sulphate of lime and oxide of iron might be returned again to the position formerly occupied by the oxide of iron alone, and there made to combine with a fresh portion of cyanogen; and so on, time after time. We have seen some cwts. of prussiate of potash prepared in this way by Mr. Laming, of the Chemical Works, Millwall, and can answer for the purity and value of the article. Mr. Laming has also manufactured, in a similar manner, several beautiful samples of Prussian blue.—*Newton's London Journal.*

Surrey Consumers' Gas Company.—Messrs. Beresford, Clark, Wagstaff, and Bowditch, have resigned their seats as directors of this company, rather than encounter the increased personal liabilities which their retention of office would have involved. The directors who remain were lately sumptuously entertained at a whitebait dinner given by the solicitor, at Greenwich, preparatory, it is presumed, to delivering in his first three years' bill of costs.

New Voltaic Battery.—Mr. Martyn Roberts has recently invented a voltaic battery of new construction, and professedly of great economy, which he has at present in action in the neighbourhood of Great Portland-street. The battery consisted of fifty plates of tin about 6 inches by 4—each plate being adjusted between two plates of platinum of the same size. These were placed in stoneware cells about two feet deep, which were filled with diluted nitric acid. The object of these deep cells was, to obtain a marketable product which should be sufficiently valuable to cover the cost of the agents employed to effect the development of electricity. The upper stratum of nitric acid acts on the tin, and forms with that metal an oxide, which falls off from the plate the moment it is formed, and is precipitated as a hydrated oxide of tin to the bottom of the cell. This oxide is combined with soda; and, as stannate of soda is extensively employed in dyeing and calico-printing, it is stated that this product will yield a profit of 20 per cent. on the cost of the battery by which it is produced; but this is a point which we are not at present in a position to determine. The electrical action of the fifty pairs of plates was considerable. The current was employed to exhibit the electrical light, and the effects produced were certainly very brilliant. It was not possible to compare it with the result obtained from a Grove's battery, but we judge their powers to be nearly equal. An experiment made on the decomposition of water, gave about 7* cubic inches of the mixed gases, oxygen and hydrogen, per minute. We cannot but regard this very ingenious arrangement as an improvement on the ordinary batteries, as far as economy is concerned, where an electric current is required, since the stannate formed must always be of considerable commercial value. It is curious, too, that the stratum of fluid in the immediate neighbourhood of the voltaic plates is kept uniformly of the same specific gravity, notwithstanding that the acid is rapidly removed. The oxide of tin formed takes down water with it, and at the same time establishes a current by which fresh acid is supplied to the plates. We were informed that the battery continued in most uniform action for sixteen hours.—*Athenæum.*

* Should be 35.—Ed. J. G. L.

Advertisements.

GEORGE and SAMUEL CUTLER,
GASHOLDER MAKERS,
No. 8, Wenlock-road, City-road, LONDON.

Contracts for Tanks, Gasholders, Roofs, Purifiers, and all descriptions of Gas Apparatus executed on the most reasonable terms. Improved Slide Valves, Steam and Range Boilers, and Smiths' Work, of the best materials and workmanship.

FIRE-CLAY Retorts, Fire-bricks, &c.
FRASER and SANDERSON, Inverkeithing, continue to supply GAS RETORTS and all fire-clay goods of the best quality. They were the first makers of Fire-clay Retorts, supply above one half of Scotch gas works, and guarantee their retorts to give satisfaction. Their retorts of 4 in. thick will generally work two years and sometimes have gone four years. Mr. Francis Ford, 24, Leadenhall-street, Agent for London.

GASHOLDERS with Cast-Iron Tanks
and Columns, STEAM-ENGINE BOILERS of every description, and General Wrought-Iron Work, manufactured by MELROSE and COWLEY.
Works—Bradley, near Bilston, Staffordshire. Office in London—78, Hatton-garden.

HARPERS AND MOORE,
DELPH FIRE CLAY WORKS, STOURBRIDGE.
London Depot, No. 7, Wenlock-road, City-road, where they have always on hand a large stock of their best Stourbridge Fire Bricks, Lumps, Quarries, Burrs, Gas Retorts, Crucibles, &c. &c.
Fire goods of every description made to order.

LOSH, WILSON, and BELL,
Newcastle-on-Tyne,
Manufacturers of Bar Iron, Railway Bars, Forge and Engine Work, Cast Iron Goods, and Stewart's Patent Cast Iron Gas and Water Pipes.
Office, No. 7, Size-lane, London.

ESTABLISHED IN 1834.

S. KING, Gas Meter Manufacturer,
21, Cock-lane, West Smithfield, London.
Meters made of the best materials and workmanship, with all the recent improvements, and warranted correct in registration.

M. SHEEN, Gas and Railway
Lantern Maker, 90½, Holborn-hill, begs to inform Managers of Gas Works, &c., that she continues to contract and supply Lanterns on reasonable terms, and keep them in repair by the year.

ADDISON POTTER,
WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of Clay Retorts, Fire Bricks, and every description of Fire Clay Goods.

METER INDICES.

J. CLUER, Gas Meter, Index Maker,
and Model Machinist, No. 1, Bowling-green-lane, Clerkenwell, London.
INDICES and all other Apparatus for Gas Meters of every size and kind, made on the shortest notice, of the best metal, and of superior workmanship.

JAMES RUSSELL and SONS,
PATENT WROUGHT-IRON TUBE MANUFACTURERS,
WEDNESBURY, and
81, UPPER GROUND-STREET, BLACKFRIARS, LONDON.

WEST and GREGSON,
GAS METER MANUFACTURERS, BRASSFOUNDERS, &c., UNION-STREET, OLDHAM.
Station and Experimental Meters, Gas Pressure Registers, Gauges, Experimental Gasholders, Governors, Slide Valves, &c. &c.

JOSEPH BOULTON, Gas Meter
Manufacturer, No. 1, COPPICE-ROW, CLERKENWELL, LONDON, begs to call the attention of Gas Companies and the public in general to his improved GAS METER, containing all the latest improvements.
J. B. warrants all Meters to be manufactured of the best materials and workmanship, the wheels, &c., being of metal. Old Meters repaired on the lowest terms.

G. E. DEELEY, Harrow-bridge Iron
Foundry, Stratford, Essex (late of the Red Lion Foundry, Whitechapel), Manufacturer of STEAM ENGINES, Boilers, Gasholders and Gas Apparatus, Tanks, Backs, Wrought and Cast Iron Roofs, Girders, Columns, Stanchions, Socket and Flange Pipes; Rain-water Pipes, Heads, and Shoes; Garden and Field Rollers, Ploughshares and Points; Wrought-iron Hurdles, Railing, and Carriage Gates; Pig and Sheep Troughs, &c.
N.B. Smiths' Work in general.

Share List.

(Directors and Managers of Gas Works are earnestly requested to enable us to rectify any errors and fill up the omissions in the following List.)

The Companies whose names are printed in italic type are incorporated by Act of Parliament.

Number of Shares issued.	Amount per Share	Name of Company.	Amount paid up per Share	Dividend per Cent. per Ann.	Price.
	£	**ENGLAND.**	£ s. d	£ s. d	£ s. d
		Aberdare			
		Aberystwith			
		Abingdon			
		Accrington £7000		5 0 0	
		Albrighton			
		Alcester			
		Alford, Lincolnsh.			
		Alfreton			
		Alnwick			
		Alston Moor			
250	10	Alton	10 0 0	5 0 0	10 0 0
800	5	Altrincham	5 0 0	6 0 0	
		Amlwch			
160	10	Ampthill	10 0 0	5 0 0	10 0 0
350	10	Andover	10 0 0	6 0 0	11 0 0
		Appleby			
		Arundel			
		Ashbourn, Derby			
		Ashburton			
		Ashby-de-la-Zouch			
		Ashford, Kent			
1600	25	*Ashton-under-Lyne*	25 0 0	10 0 0	52 0 0
		Atherstone			
		Axminster			
200	20	Aylesbury	20 0 0	5 0 0	21 0 0
		Aylsham, Norfolk			
		Bacup, Lancashire			
		Bakewell			
		Baldock			
140	25	Banbury	25 0 0	10 0 0	50 0 0
		Bangor			
500	5	Barking, Essex	4 10 0	5 11 0	5 0 0
250	10	Barnard Castle	10 0 0	5 10 0	10 15 0
		Barnet			
		Barnsley £6000		7 10 0	
100	20	Barnstaple	20 0 0	5 0 0	23 0 0
		Barton			
120	25	Basingstoke	25 0 0	8 0 0	28 0 0
2400	20	*Bath*	16 0 0	6 0 0	25 to 30
		Battle £2000		6 0 0	
56	26½	Bawtry	26 10 0	5 0 0	25 0 0
		Beaumaris			
		Beccles, Bungay, and Lowestoft			
		Bedford			
		Bedworth			
		Belford			
		Bedale, Yorkshire			
		Belper			
		Beminster			
		Berkhempstead			
700	5½	Berwick-on-Tweed	5 10 0	6 8 0	5 15 0
		Beverley			
		Bewdley			
280	10	Bideford	10 0 0	6 0 0	10 10 0
		Biggleswade			
160	10	Bicester	10 0 0	5 0 0	10 0 0
		Bilston £15,100		8 0 0	
		Billericay			
		Bingley £7400		4 0 0	
		Birkenhead £70,000	35 0 0	3 0 0	35 to 37
2400	50	*Birmingham and Staffordshire*	50 0 0	10 0 0	96 to 97
	25	*Ditto*, new shares	7 10 0	10 0 0	10 pm.
928	75	*Birmingham*	75 0 0	10 0 0	149 to 151
		Bishop's Auckland			
140	25	Bishop's Stortford	25 0 0	5 0 0	24 0 0
		Blackburn £30,000		10 0 0	
		Blackpool			
		Blandford			
		Blythe			
		Bodmin			
		Bognor			
		Bolton £38,582		9 19 5	
		Boroughbridge			
		Boston £8000		10 0 0	
200	10	Bourn	10 0 0	5 0 0	
		Brackley			
		Bradford, Wilts			
		Bradford, Yorksh. £45,000		9 10 0	
		Brampton, Cumb.			
		Brandon, Suffolk			
		Brecon			
		Bridge-end, Glam.			
		Brierly Hill			
2250	20	*Brighton*	20 0 0	5 0 0	15 to 17
1125	20	,, new shares	16 0 0	5 0 0	
		Brighton and Hove £50,276		3 10 0	
4250	20	*Bristol*	20 0 0	9 0 0	37 0 0
1725	25	*Bristol and Clifton*	25 0 0	6 0 0	25 0 0
		Brixham			
		Braintree			
750	50	*Brentford*	50 0 0	6 0 0	44 to 46
800	25	,, new shares	11 0 0	6 0 0	11 0 0
		Brentwood			
		Bridgwater £6000		5 0 0	
400	10	Bridlington	10 0 0	5 0 0	10 0 0
		Bridport			
		Brigg			
		Broadstairs			
100	50	Bromley, Kent	50 0 0	6 0 0	52 10 0
		Bromsgrove			
		Broughton			
120	10	Bruton	10 0 0	4 0 0	8 0 0
100	25	Buckingham	25 0 0	5 0 0	25 0 0
		Bungay (see Becls.)			
		Burford			
		Burnley £19,946		4 10 2	
		Burslem & Tunstall			
		Burton-on-Trent			
		Bury, Lanc. £6570			
		Bury St. Edmund's		5 0 0	
		Buxton	10 0 0		
		Callington			
		Calne, Wilts			
		Camborne			
		Cambridge £34,560		7 0 0	
240	50	*Canterbury*	50 0 0	6 0 0	57 to 58
240	25	*Ditto*, second issue	25 0 0	6 0 0	28 to 29
		Cardiff £12,000		7 10 0	
		Carmarthen			
		Castleford			
		Chapel on the Frith			
		Chard			
		Chatteris			
		Cheadle			
		Chelmsford			
		Cheltenham £18,732		8 10 0	
		Chepstow			
		Chertsey			
230	10	Chesham, Bucks	10 0 0		
		Chester			
		Chester-le-Street			
		Chesterfield £13,123		4 17 6	
240	25	Chichester	25 0 0	6 0 0	30 0 0
		Chippenham			
		Chipping Norton			
		Chirk			
		Chorley			
		Christchurch			
		Chudleigh			
		Cirencester			
		Clifton (Bristol and			
		Cleckheaton, York.			
		Clitheroe			
		Cockermouth			
		Colchester			
		Collumpton			
		Colne, Lancashire			
		Coleford, Gloucest.			
		Coggeshall			
		Congleton £5000		5 0 0	
		Cowbridge			
		Corsham			
800	25	*Coventry*	25 0 0	6 0 0	24 to 25
		Cowes			
		Crewkerne			
		Croydon £20,000		5 0 0	
		Cranbrook £1900		5 0 0	
		Crayford			
		Crediton			
		Crewe, Cheshire			
		Cricklade			
		Darlaston			
		Darlington			
250	20	Dartford	20 0 0	7 10 0	27 0 0
		Dartmouth			
125	20	Daventry	20 0 0	6 0 0	24 8 0
		Dawley, Salop			
		Dawlish			
		Dedington			
500	6	Denbigh	6 0 0	5 0 0	6 0 0
820	10	Deptford	10 0 0	5 0 0	1 to 2
325	50	*Derby*	50 0 0	10 0 0	
90	20	Dereham (East)	20 0 0	4 10 0	
1000	5	*Dewsbury*	5 0 0	10 0 0	8 12 6
		Devizes			
4000	5	*Devonport*	5 0 0	6 0 0	6 5 0
280	25	Dorchester	25 0 0	5 0 0	30 0 0
120	25	Dorking	20 10 0	5 0 0	21 10 0
		Douglas, Isle of M.			
209	56½	*Dover*	56 10 0	5 15 0	71 to 72
		Downham			
		Driffield			
		Droitwich			
600	20	*Dudley*	20 0 0	4 0 0	20 to 21
		Droylsden			
		Dunmow			
		Dunstable			
		Durham			
276	9	Dursley, Gloster	9 0 0	5 10 0	8 0 0
300	10	Eastbourne			
		East Grinstead			
		Elland			
		Ellesmere			
		Eltham			
		Enfield			
300	19	Epsom and Ewell	19 0 0		
		Evesham			
		Exeter £40,000		10 0 0	
		Exmouth			
		Eye, Suffolk			
		Fairford			
64	25	Fakenham	25 0 0	5 0 0	25 0 0
		Falmouth			
		Fareham			
120	25	Farnham	25 0 0	10 0 0	42 0 0
		Farringdon			
		Faversham			
		Ferrybridge			
		Fleetwood			
300	10	Folkestone	10 0 0	10 0 0	15 0 0
240	10	,, new shares	8 0 0	10 0 0	13 0 0
		Fowey			
240	5	Framlingham	5 0 0	5 0 0	5 0 0
		Frome			
		Garstang			
		Gillingham, Dorset			
		Glastonbury			
		Glossop £10,000		9 0 0	
1000	25	*Gloucester*	25 0 0	7 10 0	28 0 0
		Gomersal			
		Godalming			
		Gosport			
		Grantham			
20		Gravesend	20 0 0	5 0 0	21 0 0
1000	10	*Great Grimsby*	8 0 0	8 0 0	12 to 12½
		Guildford	25 0 0	4 0 0	20 0 0
		Guisborough			
		Hadleigh			
		Hales Owen			
300	6	Halesworth	6 0 0	7 10 0	5 10 0
		Halifax £15,000		10 0 0	
		Halstead			
		Hampton Court			
		Harrogate £10,000		5 0 0	
		Hartlepool £15,137		7 10 0	
		Haslingden, Lansh			
330	50	Hastings and St. L.	50 0 0	6 0 0	60 0 0
		Haverhill			
		Haworth, Yorks.			
		Hayle			
		Helstone			
		Hemel Hempstead			
300	10	Henley-on-Thams.	10 0 0		
		Hereford £5300		4 0 0	
		Herne Bay			
270	10	Hexham	10 0 0	7 0 0	12 0 0
		Heywood £10,000		5 0 0	
		Highworth (Wilts)			
230	10	Hinckley	10 0 0	5 0 0	7 0 0
		Hindley, Lancash.			
		Hitchen			
		Hythe			
		Hoddesden			
		Holbeach			
		Holmfirth £8880		3 10 0	
		Holyhead			
		Holywell (see British Provincial)			
		Honiton			
		Horncastle			
	10	Houghton-le-Sprg.	10 0 0	8 0 0	
		Horsham			
		Howden			
		Hull, Sculcoats (see British Provin.)			
		Hull, £11,712. 10s.		5 0 0	
		Hunmanby			
210	10	Hungerford	10 0 0	5 0 0	10 0 0
		Huddersfield			
520	5	High Wycombe	5 0 0	6 0 0	5 0 0
		Idle and Eccleshill			
		Ilkeston			
		Ilminster			
		Ilford			
		Ilfracombe			
		Ironbridge			
1400	10	*Ipswich*	10 0 0	8 0 0	15 0 0
1400	10	,, new shares	7 10 0	8 0 0	12 10 0
800	25	*Isle of Thanet*	20 0 0	5 0 0	20 to 21
		Kendal £9100		8 15 0	
		Kenilworth			
		Keswick			
100	25	Kettering	25 0 0	5 0 0	25 0 0
		Kiddermins. £10000		5 0 0	
		King's Langley			
		Kington, Hereford			
		Kirkby Lonsdale			
		Kirkham, Lanc.			
		Knutsford			
		Lancaster			
		Llanelly £3000		5 0 0	
		Llandovery			
		Leamington Priors £22,500		6 0 0	
		Leatherhead			
		Ledbury			
		Leeds Old Comp. old stk., £60,390		10 0 0	
		new ,, £23,775		6 0 0	
		Leeds New £60,000		10 0 0	
		Leek			
		Leicester £36,230		7 0 0	
		Leigh			
135	20	Leighton Buzzard	20 0	5 0 0	
		Leominster			
		Leyburn, Yorksh.			
		Liskeard			
330	25	Lewes	25 0 0	5 0 0	25 0 0
		Lincoln £8000		10 0 0	
		Leyland, Lancash.			
		Littlehampton			
250	20	Lichfield	20 0 0	10 0 0	30 0 0
		Liverpool United	100 0 0	10 0 0	206 to 208
		,, ¼ sh.	25 0 0	10 0 0	51 to 52
		Langport			
		London Comps.—			
5000	40	*British*	18 0 0	1 18 10	12 0 0
5000	20	,, Provincial— (Holywell, Hull, Norwich, Potteries, Trowbridge)	20 0 0	7 0 0	21 10 0
	20	,, Prov., new	10 0 0	7 0 0	10 to 12
4000	25	*Commercial*	25 0 0	6 0 0	27 to 29
2000	25	,, new shares	2 10 0	6 0 0	par to 1 pm
		,, debentures £12,000			
12,000	50	*Chartered*	50 0 0	4 0 0	36 to 38
6000	50	,, new shares	10 0 0	4 0 0	6¾ to 7¼
2000	150	*City of London*	150 0 0	4 0 0	126 to 128
4000	50	*Equitable*	50 0 0	2 10 0	25 to 26
		,, debentures £46,000			
10,000	20	European— (Amiens, Boulogne, Caen, Havre, Nantes, and Rouen)	20 0 0	5 0 0	10 to 12
		,, do. new	7 0 0	5 0 0	5 to 6

Number of Shares issued.	Amount per Share	Name of Company.	Amount paid up per Share	Dividend per Cent. per Ann.	Price.
	£		£ s. d	£ s. d	£ s. d
15,000	10	*Gt.Cntl.Consumers*	10 0 0	10 0 0	12¼ to 13½
		Impl.Continental —First capital (Amsterdam, Berlin, Ghent, Hanover, Lille, Rotterdam)	42 0 0	6 11 0	44 to 46
7000	50	Second capital—(Aix la Chapelle, Antwerp, Bordeaux, Brussels, Cologne, Frankfort-on-Maine, Haarlem, Marseilles, Toulouse Vienna)	41 0 0	10 7 0	68 to 70
	50	Third capital	43 10 0	9 4 0	65 to 70
10,000	50	*Imperial*	50 0 0	6 0 0	72 to 73
3000	50	„ new shares	45 0 0	6 0 0	60 to 62
		„ debentures £50,500			
4000	40	*Independent*	10 0 0	6 0 0	46 to 47
3000	50	*London*	50 0 0		2 10 0
6000	25	„ preference	25 0 0	6 0 0	25 0 0
3000	50	„ 2nd do.	50 0 0		15 to 18
9000	50	*Phœnix*	49 0 0	3 10 0	24 to 25
1000	100	*Ratcliff*	90 0 0	5 0 0	60 to 65
4000	25	*South Metrop.*	25 0 0	5 0 0	22 to 23
	10	Surrey Consumers'	10 0 0	4 0 0	
9000	50	United General—(Cork, Dublin, Limerick)	50 0 0	2 0 0	20 to 22
12,500	20	Western	20 0 0	2 0 0	10 0 0
		Lostwithiel			
		Loughborough			
240	25	*Louth*	25 0 0	6 0 0	26 10 0
		Lowestoft (see Bec.			
611	5	Ludlow Union	5 0 0	6 0 0	5 0 0
		Luton			
		Lutterworth			
		Lyme Regis			
		Lymington			
		Malmesbury			
		Macclesfield 32,000		3 15 0	
		Maidenhead			
300	50	*Maidstone*	50 0 0	10 0 0	90 0 0
		Maldon			
		Marlborough			
		Malton (New)			
		Malvern			
		Manningtree			
		Mansfield £5000		10 0 0	
		March			
		Margate (see I. of T.			
		Market Deeping			
		Market Drayton			
132	25	Market Harboro'	25 0 0	6 0 0	30 0 0
		Market Raisin			
		Market Weighton			
		Marlow			
370	10	Maryport	10 0 0	6 0 0	12 0 0
		Melksham			
		Melton Mowbray			
		Merthyr Tydvil			
		Mere			
		Middleton £9039		5 0 0	
		Midsummer Norton			
		Middlesboro'			
		Mildenhall			
		Mitcham			
		Mold			
700	10	Monmouth	10 0 0	5 0 0	
		Monk Wearmouth			
		Moreton in Marsh			
		Morley			
		Mottram			
		Morpeth			
		Nantwich			
		Neath			
		Needham Market			
		Newark £5000		10 0 0	
250	20	Newbury	20 0 0	5 0 0	20 0 0
13,000	5	Newcastle & Gateshead Union	5 0 0	8 0 0	8 0 0
		Newcastle-under-Lyne £6200		4 0 0	
600	5	Newmarket	5 0 0	6 0 0	5 0 0
		Newnham, Glost.			
		Newent			
		New Mills £9115		8 0 0	
		Newport, M. £11720			
320	50	*Newport, Isle of W.*	38 0 0	4 0 0	5 0 0
		Newport Pagnell			
		Newport, Salop			
		Newton Abbot			
		Newton, Lanc.			
		Northallerton			
		North Walsham			
542	20	*Northampton*	18 0 0	10 0 0	27 0 0
		Northwich			
		Norwich (see British Pro. £40,000		7 0 0	
900	50	*Nottingham*	50 0 0	10 0 0	
900	50	New shares		10 0 0	
		Nuneaton			
		Oakham			
		Oakhampton			
200	10	Odiham, Hants	10 0 0	4 0 0	10 0 0
		Oldham			
		Olney			
		Ongar			
		Ormskirk			
		Otley, Yorkshire			
		Oundle			
120	150	*Oxford*	150 0 0	8 0 0	260 0 0
		Over Darwen £8000		5 0 0	
		Padstow			
		Pately Bridge, Yrk.			
250	20	Penrith	15 0 0	6 10 0	21 0 0
		Penryn			
		Penzance			
200	10	Petworth	10 0 0	8 0 0	12 0 0
		Petersfield			
		Pickering			
3000	10	*Plymouth*	10 0 0	10 0 0	11 0 0
		Pocklington			
		Pontefract			
		Pontypridd			
400	10	Poole	10 0 0	5 0 0	10 0 0
		Port Madoc			
600	50	*Portsea Island*	53 0 0	5 0 0	45 to 47
400	10	Prescott	9 0 0	4 13 4	7 0 0
3000	20	*Preston*	20 0 0	10 0 0	
		Pwllheli			
		Pudsey £12,000		5 0 0	
		Radcliff and Pilkington £9000		4 12 10	
		Ramsay, I. of Man			
		Ramsgate (see I. of T			
		Ravenglass			
1000	10	*Reading*	10 0 0	4 0 0	7 0 0
500	20	*Reading Union*	20 0 0	6 0 0	17 0 0
		Redditch			
		Redruth			
		Reigate			
		Retford (East)			
		Rhyl			
		Richmond (Surrey)			
		Ringwood			
		Ripon			
		Rochester and Chatham £20,000		6 0 0	
		Rochford			
		Rockingham			
		Romford			
		Ross			
215	25	*Rotherham*	25 0 0	6 0 0	40 10 0
		Royston			
		Ruabon			
		Rugby			
		Rugeley			
		Runcorn £11,000		7 10 0	
		Ruthin			
500	10	Ryde	10 0 0	6 0 0	12 0 0
		Rye			
		Romsey			
		Saddleworth			
225	20	Saffron Walden	20 0 0	3 15 0	19 0 0
		St. Austel			
		St. Asaph			
		St. Colomb			
		St. Helen's £7500		7 10 0	
		St. Helier's (Jersey)			
		St. Ives, Hunting.			
		St. Ives, Cornwall			
250	10	St. Neot's	10 0 0	8 0 0	12 0 0
		St. Peter's Port, (Guernsey)			
320	25	Salisbury	25 0 0	6 0 0	28 to 30
		Sandbach			
140	10	Saxmundham	10 0 0	5 0 0	10 0 0
		Scarborough			
		Sedburgh			
		Selby			
		Settle			
290	10	Sevenoaks	10 0 0	5 0 0	10 0 0
		Shaftesbury			
5400	25	*Sheffield United*	24 0 0	8 6 8	30 0 0
		Shelton, Potteries (see Brit. Prov.)			
		Shepton Mallet			
		Sherborne			
2914	5	Shields (Tynemth	5 0 0	3 0 0	5 0 0
		Shields (South)			
		Shiffnal, Salop			
1000	5	*Shipley*	5 0 0	6 0 0	5 12 6
		Shipston-on-Stour			
		Shoreham			
		Shrewsbury £10,000		7 0 0	
400	10	Skipton	10 0 0	4 0 0	11 0 0
		Sleaford			
350	10	Slough	10 0 0		
		Snaith			
		Soham			
		Southwold			
		South Molton			
1000	50	*Southampton*	32 0 0	5 0 0	
		Sowerby, Yorksh.			
		Stretford			
		Stokesly			
		Stafford £10,000		5 0 0	
		Staines and Egham			
		Staley Bdg. £15,000		10 0 0	
		Stamford £11,250		3 0 0	
		Stockton-on-Tees £7980		9 5 0	
840	9¼	Stockton, New	9 10 0	9 0 0	8 0 0
960	16	Stoke-upon-Trent	10 0 0	7 0 0	11 10 0
500	10	„ new shares	6 0 0	7 0 0	7 10 0
		Stone, Stafford			
		Stoney Stratford			
		Stourbridge			
		Stowmarket			
150	20	Stratford-on-Avon	20 0 0	7 10 0	30 0 0
		Stroud			
169	10	Swaffham	10 0 0	5 0 0	5 10 0
		Swansea £9000			
		Sudbury			
6400	5	Sunderland, old	5 0 0		
		Sunderland, new			
		Sutton			
		Swindon			
		Sydenham			
2800	5	*Taunton*	5 0 0	None	2 10 0
		Tadcaster			
		Tamworth			
		Tavistock			
		Teignmouth			
		Tenbury			
		Tenby			
		Tenterden £2000		2 10 0	
		Tetbury, Gloster			
		Tewkesbury			
		Thame			
		Thetford			
		Thirsk			
		Thornbury			
		Thorne			
		Tiverton			
670	5	Todmorden		3 0 6	
		Torquay			
		Torrington, Devon			
		Totnes			
		Totnes Consumers			
4000	5	Tottenham		3 10 0	6 0 0
		Towcester			
200	10	Tring		10 0 0	5 0 0
		Trowbridge (see British Provin.)			
75	50	Truro		50 0 0	2 0 0
		Tunbridge			
		Tunbridge Wells			
		Ulverston			
		Uppingham			
240	5	Upton-on-Severn		5 0 0	5 0 0
		Usk, Monmouth			
		Uttoxeter			
		Uxbridge			
		Ventnor			
1000	25	*Wakefield*, old capl		25 0 0	6 0 0
1600	5	„ new „		5 0 0	6 0 0
300	10	Wallingford		10 0 0	5 0 0
		Wandsworth			
		Wantage			10 0 0
		Warrington £23304			
100	10	Wareham		10 0 0	3 10 0
120	25	Warminster		25 0 0	5 0 0
		Warth			
		Warwick £15,000			6 0 0
		Watford			
		Welchpool, Mntgy.			
		Wellingborough			
		Wellington, Salop			
		Wellington, Smrst.			
		Wells, Smrst. £5000			7 10 0
		Westbury			
		Weston-sup.-Mare			
2000	5	West Ham		5 0 0	6 0 0
		Whitby			
		Whitehaven			
		Whitstable			
		Whittlesea			
		Wigan £10,160			10 0 0
		Willenhall			
		Winchelsea			
		Winslow			
240	10	Wimborne Minster		10 0 0	
		Wincanton			
360	50	Winchester		50 0 0	6 0 0
900	12½	Windsor		12 10 0	10 0 0
		Witham			
		Witney			
4448	10	*Wolverhampton*		10 0 0	7 10 0
		Woburn			
210	10	Wokingham		10 0 0	
		Woodbridge			
		Wooler			
		Wotton-un.-Edge			
		Worcester £29,000			8 0 0
		Workington			
		Worksop & Radford			
		Wirksworth			
		Worthing			
		Wrexham			
		Woolwich Equitbl.			
		Woolwich Consms.			
		Woolwich (North)			
		Wymondham			
		Yarm			
795	20	Yarmouth		20 0 0	
		Yeadon, near Leeds			
		Yeovil			
		York Untd. £55,000			7 0 0
		SCOTLAND.			
	5	Aberdeen		3 0 0	
		Airdrie			
		Alloa			
		Annan			
		Anstruther			
		Ardrossan			
550	20	Arbroath		20 0 0	7 10 0
		Auchterarder			
750	2	Auchtermuchty		2 0 0	6 0 0
		Ayr, old			
		Ditto, new			
		Banff			
		Barrhead			
		Bathgate			
		Beith			
		Bervie			
		Biggar			
		Blairgowrie			
400	6	Borrowstowness		6 0 0	5 0 0
		Brechin			
		Bridge of Allan			
	2	Broughty Ferry		2 0 0	5 0 0
		Burntisland			
		Callen			
		Campbelton			
		Clackmannan			
		Coatbridge			
		Coldstream			
		Collinsburgh			
		Comrie			
		Crieff			
		Crail, Fife			
		Cumbernauld			
		Cumnock			
600	5	Cupar Angus		5 0 0	6 0 0
250	10	Cupar Fife		10 0 0	7 10 0
		Dalkeith			
		Denny			
		Dingwall			
		Dornoch			
		Douglas			
		Dumbarton			
400	20	Dumfries		14 0 0	5 0 0
		Dunbar			

Number of Shares issued.	Amount per Share	Name of Company.	Amount paid up per Share	Dividend per Cent. per Ann.	Price.
	£		£ s. d	£ s. d	£ s. d
		Pickering			
3000	10	*Plymouth*	10 0 0	10 0 0	11 0 0
		Pocklington			
		Pontefract			
		Pontypridd			
400	10	Poole	10 0 0	5 0 0	10 0 0
		Port Madoc			
600	50	*Portsea Island*	53 0 0	5 0 0	45 to 47
400	10	Prescott	9 0 0	4 13 4	7 0 0
3000	20	*Preston*	20 0 0	10 0 0	
		Pwllheli			
		Pudsey £12,000		5 0 0	
		Radcliff and Pilkington £9000		4 12 10	
		Ramsay, I. of Man			
		Ramsgate (see I. of T			
		Ravenglass			
1000	10	*Reading*	10 0 0	4 0 0	7 0 0
500	20	*Reading Union*	20 0 0	6 0 0	17 0 0
		Redditch			
		Redruth			
		Reigate			
		Retford (East)			
		Rhyl			
		Richmond (Surrey)			
		Ringwood			
		Ripon			
		Rochester and Chatham £20,000		6 0 0	
		Rochford			
		Rockingham			
		Romford			
		Ross			
215	25	*Rotherham*	25 0 0	6 0 0	40 10 0
		Royston			
		Ruabon			
		Rugby			
		Rugeley			
		Runcorn £11,000		7 10 0	
		Ruthin			
500	10	Ryde	10 0 0	6 0 0	12 0 0
		Rye			
		Romsey			
		Saddleworth			
225	20	Saffron Walden	20 0 0	3 15 0	19 0 0
		St. Austel			
		St. Asaph			
		St. Colomb			
		St. Helen's £7500		7 10 0	
		St. Helier's (Jersey)			
		St. Ives, Hunting.			
		St. Ives, Cornwall			
250	10	St. Neot's	10 0 0	8 0 0	12 0 0
		St. Peter's Port, (Guernsey)			
320	25	Salisbury	25 0 0	6 0 0	28 to 30
		Sandbach			
140	10	Saxmundham	10 0 0	5 0 0	10 0 0
		Scarborough			
		Sedburgh			
		Selby			
		Settle			
290	10	Sevenoaks	10 0 0	5 0 0	10 0 0
		Shaftesbury			
5400	25	*Sheffield United*	24 0 0	8 6 8	30 0 0
		Shelton, Potteries (see Brit. Prov.)			
		Shepton Mallet			
		Sherborne			
2914	5	Shields (Tynemth	5 0 0	3 0 0	5 0 0
		Shields (South)			
		Shiffnal, Salop			
1000	5	*Shipley*	5 0 0	6 0 0	5 12 6
		Shipston-on-Stour			
		Shoreham			
		Shrewsbury £10,000		7 0 0	
400	10	Skipton	10 0 0	4 0 0	11 0 0
		Sleaford			
350	10	Slough	10 0 0		
		Snaith			
		Soham			
		Southwold			
		South Molton			
1000	50	*Southampton*	32 0 0	5 0 0	
		Sowerby, Yorksh.			
		Stretford			
		Stokesly			
		Stafford £10,000		5 0 0	
		Staines and Egham			
		Staley Bdg. £15,000		10 0 0	
		Stamford £11,250		3 0 0	
		Stockton-on-Tees £7980		9 5 0	
840	9¼	Stockton, New	9 10 0	9 0 0	8 0 0
960	16	Stoke-upon-Trent	10 0 0	7 0 0	11 10 0
500	10	„ new shares	6 0 0	7 0 0	7 10 0
		Stone, Stafford			
		Stoney Stratford			
		Stourbridge			
		Stowmarket			
150	20	Stratford-on-Avon	20 0 0	7 10 0	30 0 0
		Stroud			
169	10	Swaffham	10 0 0	5 0 0	5 10 0
		Swansea £9000			
		Sudbury			
6400	5	Sunderland, old	5 0 0		
		Sunderland, new			
		Sutton			
		Swindon			
		Sydenham			
2800	5	*Taunton*	5 0 0	None	2 10 0
		Tadcaster			
		Tamworth			
		Tavistock			
		Teignmouth			
		Tenbury			
		Tenby			
		Tenterden £2000		2 10 0	
		Tetbury, Gloster			
		Tewkesbury			
		Thame			
		Thetford			
		Thirsk			
		Thornbury			
		Thorne			
		Tiverton			
670	5	Todmorden		3 0 6	
		Torquay			
		Torrington, Devon			
		Totnes			
		Totnes Consumers			
4000	5	Tottenham		3 10 0	6 0 0
		Towcester			
200	10	Tring		10 0 0	5 0 0
		Trowbridge (see British Provin.)			
75	50	Truro		50 0 0	2 0 0
		Tunbridge			
		Tunbridge Wells			
		Ulverston			
		Uppingham			
240	5	Upton-on-Severn		5 0 0	5 0 0
		Usk, Monmouth			
		Uttoxeter			
		Uxbridge			
		Ventnor			
1000	25	*Wakefield*, old capl		25 0 0	6 0 0
1600	5	„ new „		5 0 0	6 0 0
300	10	Wallingford		10 0 0	5 0 0
		Wandsworth			
		Wantage			10 0 0
		Warrington £23304			
100	10	Wareham		10 0 0	3 10 0
120	25	Warminster		25 0 0	5 0 0
		Warth			
		Warwick £15,000			6 0 0
		Watford			
		Welchpool, Mntgy.			
		Wellingborough			
		Wellington, Salop			
		Wellington, Smrst.			
		Wells, Smrst. £5000			7 10 0
		Westbury			
		Weston-sup.-Mare			
2000	5	West Ham		5 0 0	6 0 0
		Whitby			
		Whitehaven			
		Whitstable			
		Whittlesea			
		Wigan £10,160			10 0 0
		Willenhall			
		Winchelsea			
		Winslow			
240	10	Wimborne Minster		10 0 0	
		Wincanton			
360	50	Winchester		50 0 0	6 0 0
900	12½	Windsor		12 10 0	10 0 0
		Witham			
		Witney			
4448	10	*Wolverhampton*		10 0 0	7 10 0
		Woburn			
210	10	Wokingham		10 0 0	
		Woodbridge			
		Wooler			
		Wotton-un.-Edge			
		Worcester £29,000			8 0 0
		Workington			
		Worksop & Radford			
		Wirksworth			
		Worthing			
		Wrexham			
		Woolwich Equitbl.			
		Woolwich Consms.			
		Woolwich (North)			
		Wymondham			
		Yarm			
795	20	Yarmouth		20 0 0	
		Yeadon, near Leeds			
		Yeovil			
		York Untd. £55,000			7 0 0
		SCOTLAND.			
	5	Aberdeen		3 0 0	
		Airdrie			
		Alloa			
		Annan			
		Anstruther			
		Ardrossan			
550	20	Arbroath		20 0 0	7 10 0
		Auchterarder			
750	2	Auchtermuchty		2 0 0	6 0 0
		Ayr, old			
		Ditto, new			
		Banff			
		Barrhead			
		Bathgate			
		Beith			
		Bervie			
		Biggar			
		Blairgowrie			
400	6	Borrowstowness		6 0 0	5 0 0
		Brechin			
		Bridge of Allan			
	2	Broughty Ferry		2 0 0	5 0 0
		Burntisland			
		Callen			
		Campbelton			
		Clackmannan			
		Coatbridge			
		Coldstream			
		Collinsburgh			
		Comrie			
		Crieff			
		Crail, Fife			
		Cumbernauld			
		Cumnock			
600	5	Cupar Angus		5 0 0	6 0 0
250	10	Cupar Fife		10 0 0	7 10 0
		Dalkeith			
		Denny			
		Dingwall			
		Dornoch			
		Douglas			
		Dumbarton			
400	20	Dumfries		14 0 0	5 0 0
		Dunbar			

Number of Shares issued.	Amount per Share	Name of Company.	Amount paid up per Share	Dividend per Cent. per Ann.	Price.
	£		£ s. d	£ s. d	£ s. d
		Dunblane			
	23⅓	*Dundee, old*	£29,687 23 15 0	8 8 0	30 10 0
8000	5	*Dundee, new*	5 0 0	4 0 0	4 0 0
860	10	Dunfermline	10 0 0	6 0 0	12 12 0
		Dunkeld			
		Dunse			
		Dysart			
6000	25	*Edinburgh Gas Co.*	25 0 0	10 0 0	52 10 0
	25	„ *and Leith Co.*	£98,640 18 0 0	7 10 0	27 13 6
		Elie			
		Elgin			
		Falkirk, old			
		„ new			
		Falkland			
		Ferry Port on Craig			
		Fochabers			
		Forfar			
		Fort William			
		Fraserburgh			
		Galashiels			
		Garlieston			
		Gatehouse n. Fleet			
		Girvan			
	25	*Glasgow* £122,500	25 0 0	10 0 0	50 0 0
15000	10	*Glasgow City and Suburban*	9 0 0	7 15 0	17 7 6
		Grangemouth			
		Grahamston			
		Haddington			
		Hamilton £7500		8 0 0	
		Hawick			
		Helensburgh			
		Huntly			
		Inverary			
400	1	Inverkeithing	1 0 0	5 0 0	1 0 0
1200	10	*Inverness Gas and Water*	10 0 0	7 10 0	15 0 0
2400	5	„ new shares	1 5 0	7 10 0	2 5 0
		Irvine			
		Jedburgh			
		Johnstone, near Paisley			
		Keith			
		Kelso		10 0 0	
		Kilmarnock			
		Kincardine			
		Kinghorn			
		Kingskittle, Fife			
		Kinross			
		Kirkaldy			
320	5	Kirkcudbright	5 0 0	5 0 0	5 0 0
1000	3	Kirkintulloch, near Glasgow	3 0 0	5 0 0	3 0 0
227	5	Kirkwall	5 0 0	5 0 0	4 10 0
518	5	Kirriemuir	5 0 0	6 0 0	
		Lanark			

Number of Shares issued.	Amount per Share	Name of Company.	Amount paid up per Share	Dividend per Cent. per Ann.	Price.
	£		£ s. d	£ s. d	£ s. d
		Largo, near Leven			
		Largs			
		Lasswade, n. Edin.			
		Lauder			
		Leith			
		Leslie, Fife			
		Lesmahago			
		Leven			
		Linlithgow			
		Linton, n. Nobleh.			
		Lochee, n. Dundee			
		Lochgilphead			
		Lochwinnock, near Paisley			
1200	1	Markinch	1 0 0	7 10 0	1 5 0
		Mauchline			
		Maxwell-town, n. Dumfries			
		Maybole, Ayrshire			
		Maryhill, near Glasgow			
		Melrose			
718	2	Mid & East Calder	2 0 0		2 0 0
192	5	Moffat	5 0 0		
	13½	Montrose	13 10 0	7 11 1	
		Musselburgh			
		Nairn			
		Neilston, n. Glasg.			
		Newmills, near Kilmarnock			
		Newburgh, Fife			
		Newton-on-Aye			
		Newton Stewart			
		North Berwick, n. Haddington			
		North Queensferry			
		Oban			
		Peebles			
800	25	Perth	25 0 0	4 16 0	22 10 0
	5	„ new	5 0 0		2 7 6
		Peterhead			
		Pittenweem			
		Pollokshaws, near Glasgow			
		Port Glasgow			
		Portobello, n. Edin.			
		Prestonpans			
		Rutherglen, near Glasgow			
		Renfrew, n. Paisley			
		Saltcoats			
		Sanquhar			
		Selkirk			
		South Queensferry			
		St. Andrew's			
		Stewarton			
		Stirling			

Number of Shares issued.	Amount per Share	Name of Company.	Amount paid up per Share	Dividend per Cent. per Ann.	Price.
	£		£ s. d	£ s. d	£ s. d
		Stonehaven			
		Stonhouse, Lanrks.			
		Stornoway			
		Stranraer			
		Strathaven, near Hamilton			
		Thurso			
		Tillicoultry, n. Alloa			
800	1	Tranent	1 0 0		1 0 0
		Troon			
		Wick			
		Wigton			
		Wemyss	4 10 0		
		IRELAND.			
300	10	Armagh	10 0 0	8 0	14 10 0
		Ballinasloe			
700	50	*Belfast*	50 0 0		
		Ballymena			
		Ballymoney			
		Carrickfergus			
		Carlow			
		Cavan			
		Cork (see Un. Gen.)			
		Cookstown			
1300	5	Clonmel Consumrs	5 0 0	5 0 0	5 0 0
		Drogheda			
19,000	10	*Dublin Consumers*	5 0 0	7 0 0	6 0 0
		Dublin Hibernian (see United Gen.)			
160	25	Dundalk	25 0 0		22 0 0
		Dungannon			
871	5	*Downpatrick*	5 0 0	4 0 0	
		Enniskillen			
		Enniscorthy			
240	25	Galway	25 0 0	10 0 0	32 0 0
400	10	Kilkenny	10 0 0	8 0 0	11 5 0
		Larne			
		Limerick (see U.G.)			
1725	5	Limerick Consum.	5 0 0	5 0 0	5 0 0
600	15	Londonderry	15 0 0	6 13 4	21 10 0
500	7	Lisburn	7 0 0	7 10 0	7 0 0
520	10	Lurgan	6 0 0	6 0 0	6 0 0
		Mallow			
		Monaghan			
		Nenagh			
448	5	Newtownards	5 0 0	4 0 0	5 0 0
		New Ross			
		Newry			
		Omagh			
125	20	Portadown	20 0 0	6 0 0	20 0 0
600	10	Sligo	10 0 0		
		Tipperary			
		Tralee			
		Waterford			
		Wexford			

The Gas Works in the undermentioned towns belong to private individuals:—

Abergavenny.	Ely.	Hertford.	Northfleet.	Sandwich.	Waltham Abbey.
Bridgenorth.	Farsley.	Holt.	Newport I. W. (new).	Seaham Harbour.	Ware. (2 works)
Carnarvon.	Gainsborough	Huntingdon.	Oswestry.	Sheerness.	Wem.
Chester, new.	Goole.	Hyde (Cheshire)	Peterborough.	Sidmouth.	Weymouth.
Deal.	Harleston.	Kingston-on-Thames.	Pontypool.	Sittingbourne.	Whitchurch (Salop).
Diss	Hatfield.	Lynn.	St. Alban's.	Spalding.	Wisbeach.

The Gas Works belong to the Corporations, or to Commissioners acting under special acts of Parliament, in the following towns:—

Carlisle.	Greenock.	Lytham (Lanc.)	Rochdale.	Southport (Lanc.)	Walsall.
Cashel.	Haverfordwest.	Manchester.	Rothesay.	Stockport	Wells (Norfolk).
Coleraine.	Keighly.	Milton (Kent).	Richmond (Yorkshire).	Strabane.	Youghall.
Doncaster.	Knaresborough.	Paisley.	Salford.		

Price Current.

The following List of Prices is corrected by an eminent wholesale house in each trade up to the latest period:—

CASTINGS, per Ton.

Average Weight of Cast Iron Gas Pipes, per Yard.

1¼ in.	2 in.	2½ in.	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lbs.

Retail Prices are 5 to 10 per cent. higher.	London.	Glasgow	Newcastle.	Wales.	Yorksh., Derbysh., and Staffdsh.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Pig Iron, No. 1	3 7 6	2 5 0	3 0 0	3 15 0	3 10 0
1¼ and 2 inches Socket Pipes	6 5 0	5 0 0	5 10 0	5 15 0	5 15 0
2½ and 3 do. do.	5 17 6	4 15 0	5 7 6	5 12 6	5 12 6
4 and 5 do. do.	5 15 0	4 12 6	5 5 0	5 10 0	5 10 0
6 inches and upwards do.	5 12 6	4 10 0	5 2 6	5 7 6	5 7 6
Extra for bends, branches, and connection	2 0 0	2 0 0	2 0 0	2 0 0	2 0 0
Retorts, 2nd fusion, hot blast	5 5 0	4 10 0	4 17 6	4 17 6	5 0 0
Do. 2nd fusion, cold blast	5 15 0	..	..	5 5 0	5 5 0
Tank Plates, ⅜ thick and above	5 10 0	4 17 6	5 0 0	5 7 6	5 17 6
Do. less than ⅜	5 15 0	5 0 0	5 0 0	..	5 10 0
Plain Castings ex. models	5 15 0	5 0 0	5 0 0	5 10 0	5 10 0

COALS.

NEWCASTLE. Unscreened.	s.	d.	
Whitwell Primrose	4	6	per ton.
Burnhope	5	3	„
Dean's Primrose	5	9	„
Pelton, Brancepeth, Medomsley	6	0	„
Pelaw	6	3	„
Eighton Moor, Felling Main, New Pelton, Peareth, South Pelaw, Waldridge, Washington Hutton, South Peareth	6	6	„
Ramsay's Cannel	12	0	„
Cowen's Cannel	12	0	„

DERBYSHIRE.		
Clay Cross, Deep Main, and New Birchwood	6s.6d.	per ton.

SCOTCH CANNEL.		
Boghead	19 0	„
Kirkness best	23 0	„
Capeldrae, first quality	20 0	„
Ditto, second quality	10 0	„
Lothian	18 0	„
Lesmahago at Glasgow	16 6	„
Ditto at Leith	18 0	„
Arniston	16 0	„
Wemyss	15 0	„
Donibristle	10 6	„
Bridgeness, Kinneil	11 0	„
Knightswood	10 0	„
Lochgelly, Lumphinan	9 6	„

FIRE GOODS.

Best Bricks, 50s. per 1000, at Newcastle.
Do. Clay, 12s. per ton do.

LEAD.

Soft pig, £18. 10s. per ton.

WROUGHT IRON TUBING, subject to 40 per cent. Discount.

	2 inches.	1½ inch.	1¼ inch.	1 inch.	¾ inch.	½ inch.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Patent welded tubes, from 2 to 12 feet, per foot	1 8	1 0	0 10	0 7	0 5	0 4½
Ditto „ 6 in. to 18 in., each	3 0	2 0	1 9	1 3	1 0	0 9
Connecting pieces, or long screws	3 6	2 3	2 0	1 6	1 2	0 11
Bends, springs, and elbows, wrought iron	3 9	2 3	1 9	1 0	0 10	0 8
Tees, wrought or cast	4 0	2 6	2 0	1 6	1 1	0 10
Crosses, wrought or cast	4 6	3 0	2 6	2 0	1 6	1 2
Iron cocks	17 6	9 6	7 6	4 6	3 3	2 6
Ditto, with brass plug	28 0	16 0	13 0	7 0	5 6	4 6
Diminishing sockets, caps, plugs, and nipples	1 3	0 9	0 8	0 6	0 5	0 4
Plain sockets	1 0	0 8	0 7	0 5	0 4	0 3
Flanches	1 9	1 6	1 3	1 0	0 9	
Syphons, ½ quart	15 0	14 0	13 6	13 0	12 0	
Ditto 1 quart	11 6	10 6	10 3	10 0	9 6	

FREIGHTS, per Ton.

Coastwise—Newcastle.	s.	d.
Chatham & Roches.	5	6
Cork	7	6
Dover	6	0
Dublin	8	0
Exeter Quay	7	3
Folkestone	6	0
Hastings	7	0
Ipswich	5	2
Jersey	7	6
London	5	6
Lowestoft	4	0
Lynn	5	6
Margate	6	2
Portsmouth	6	6
Plymouth	6	3
Southampton	6	9
Weymouth	7	0
Yarmouth	4	0
Foreign.		
Amsterdam	8	6
Boulogne	6	9
Barcelona	17	0
Bordeaux	12	0
Calais	6	9
Dieppe	7	0
Hamburg	7	0
Havre	7	9
Lisbon	10	6
Rotterdam	7	3
Rouen	11	0
St. Petersburgh	11	0
Stettin	10	6
Trieste and Venice	18	0